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Royal Institute of British Architects.

INCORPORATED IN THE SEVENTH YEAR OF WILLIAM IV.

SESSIONAL PAPERS

1877-78.

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Royal Institute of British Architects.

SESSION 1877-8.

At the Opening Meeting of the Session, held on Monday, the 5th of November, 1877, Mr. Charles Barry, President, in the Chair, delivered the following

OPENING ADDRESS.

My dear Friends and Colleagues,

The season of year has again come round, when, according to our usual custom, it is my duty and pleasure to offer you a few remarks relating to the past year as it has affected us. It is a duty which, while I could wish it were in hands more able than mine to do it justice, is one from which I would not wish to shrink, as it is necessarily connected with the honorable office in which you have thought fit to place me, and because I know I may count on your indulgence as to any short-comings of my own in its discharge.

In the outset I think I may congratulate you that during the year now past we have gained some internal strength in our organisation, and also that the Institute, and with it the profession it so worthily represents has been more appreciated and better regarded by public bodies, and therefore I would fain hope, by the public, than has been the case for many years. The association of the Institute with the Paris Exhibition by the direct action of Royalty—with the Local Government Board and a Royal Commission by the request of the former for advice on the subject of General Building Regulations, and by the latter to be informed of the views of architects as to the law of Copyright in original designs—with the Metropolitan Board of Works, in the friendly conferences that have taken place under the Act of Parliament for the formation of Northumberland Avenue—are all illustrative of my meaning, and with regard to each subject I shall have a few words to say presently.

It may be convenient if I divide my observations broadly into those connected—

1st. *With the Inner Life of the Institute*, *i.e.*, its relation to its members—the progress and opportunities for mutual advancement and good fellowship.

2nd. *With its Outer Life*, comprising its relation, past and present, with the Government and those Public bodies with which it may be naturally more or less associated, and with the Public generally.

1st. *As to its Inner Life.*—We have been passing through a year as remarkable and important as even that when the Institute was first founded by earnest men who desired to give coherence to those whose thoughts, studies, and professional avocations should naturally lead them to associate, but who then were working singly and unaided by the advice and sympathy of their fellows. Well, I think, has that effort been rewarded, as may be seen from the fact that in 1876 upwards of 600 professional members, practising in and out of the Metropolis, had enrolled themselves as members of the Institute.

And now, that large body of our professional brethren having become so happily united in feeling, though retaining individually the distinctness and vigour of original tastes and liberty

of different lines of thought, have desired to consider carefully whether in any way their organisation might be made better,—more powerful and cordial as between themselves, and more really useful to the public, which ofttimes willingly, but sometimes grudgingly (for want of information only), seeks the aid of our services.

With this view, as you all know, more than one Committee of earnest men have laboured, and the result of all their labour has been seen in the Revised Bye Laws, which dating from the year 1877 will for some time to come, at all events, guide and govern our action.

That differences of opinion in detail should exist, and find expression on such a matter, need surprise no one, but rather be welcomed as an evidence of the interest the Institute and its laws possessed for the profession at large, and therefore as a proof of its vitality; but with the real cordiality which arises among men whose aims in life are the same, and who all belong to a liberal profession, the advice of the Committee appointed by the whole body has been substantially adopted in all its essential points, and I feel sure that the same good feeling which has brought this about will ever be active in the future to produce from it the best results. I need not point out how thoroughly dependent we all are on one another; how by the individual action the corporate power and strength of the general body is alone maintained; how if one member rejoice, all rejoice; and how if one member suffer, all suffer; to ask each and all of you to do all in your power to advance our position and usefulness, not trusting only to the action of a few of our members who may feel strongly, but can only struggle weakly if unaided, but to remember that no single successful effort by any one member of a body can fail to be of essential aid to the body itself.

I rejoice to be able here to say that the number of Professional members of the Institute in 1877 is larger than at any time in its history, while the New Class of Honorary Associates has already numbered in its ranks not a few distinguished men who are not Professional.

As to this New Class, the organisation of which dates from the present year only, but which I venture to hope, in the future, will produce large and most beneficial results, suffer me to say a few words.

We, members of the Institute, no doubt after the discussions upon the formation of the New Class which took place in this room, fully appreciate its importance, but it will be useful outside these walls to make its object known. Well then, it has been felt by us all that for some reason or other the noble aims and objects of the architectural profession were not always understood, and seldom fully appreciated by the public; for my dear colleagues, I am bold to say that, taken as a whole, the aims and objects of architects *are* noble. They desire so to study the works of great men, from the earliest ages of Art History, that they may be assimilated, so far as may be, with the art instincts and the practical wants of our own day, and that thus we may hand on unbroken the golden chain to those who are to succeed us. They are placed of necessity in a position of infinite trust, in their action for the pecuniary interest of their clients on the one hand, and, on the other, their sense of honest dealing towards those who work under their direction; and may I not be justified in saying proudly that, with very rare exceptions indeed, that trust is honorably discharged?

If then architects are not (as I think we must admit they are not invariably) credited by the public with this double effort to be "accomplished artists," and at the same time "trusted agents," it may be, and it has been thought must be, due to the fact that too little personal intercourse has hitherto existed between practising architects and those outside their ranks (and they are many) who take a real and earnest interest in their work, and would fain know more of it if opportunity were given. That opportunity is now offered by the creation of the New Class, and through it our artistic brethren in the other walks of fine Arts of Painting and Sculpture,—our Amateur Architects, of whom

many are distinguished and entitled to our respect,—our Church Dignitaries, whose duties in the sustentation, care, and repair of our National Cathedrals and Churches, lead them so frequently to express their desire to know more of architecture in its practice than they do—our Civil Engineers, who have such great power from the magnitude of their works to create a "Nightmare" or a "Joy for ever"—our Antiquarians and Archæologists—our Members of each House of Parliament, who have often to decide questions relating to our art and practice, and who sometimes so piteously confess their inability from lack of knowledge to do so to their own conscientious satisfaction—all these may, and I hope will, by becoming Honorary Associates here, gain much of the special knowledge they desire—will doubtless learn that architects have nobler aims than are represented by 5 per cent., and, albeit that represents their livelihood, can and do put it in a secondary position in relation to their clients, whether they are the public or are private individuals. We shall see that one of Johnson's definitions of the term *Honorary* (in virtue of which it has indeed been chosen), viz.: "Conferring honor without deriving gain."—*i. e.*, I presume, pecuniary gain—is entirely applicable to every gentleman on the list. Our new Associates will, I hope, be led to take a livelier interest in Architecture, regarded as a Fine Art no less than a Practical Science; while, on the other hand, I am sure I can promise them a most cordial reception within these walls, where they will find that their ideas will receive the most respectful consideration, all the more as they will be out of the professional groove in which we may be too apt to move, and their advice on our relation with the outside public they will so worthily represent, will be highly valued by us, and, I am sure, afford us useful instruction.

It has been the pleasing duty of our Secretary to read to you a list of those gentlemen who have already desired thus to join us. You cannot but be highly gratified, and I trust that the numbers of the New Class will very rapidly increase as its objects and opportunities become known.

The more permanent and distinctive constitution of your Council must also I think have a great effect for good in the future of the Institute. At its original foundation, when its adherents were necessarily few, and its organisation tentative, it was most wisely arranged that each of the comparatively small band should actively labor on the work he was in effect helping to create; but now that the vitality and vigour of the body is no longer a question, and as Professor Donaldson (our Corporate Father I may term him), so well observed on a recent occasion, your President and Council are the representatives of a body large and powerful (if united), not confined to the British Isles, much less to London alone, but extending in influence through its members in all parts of the British Empire, it is natural and right that such a body should desire to be represented permanently by those of its members who in the opinion of the body and of the public generally have become distinguished, and whose voice will carry a weight that could not attach to an ever-changing body, and thus secure for the humblest member of the Institute an attention and consideration by those outside its ranks of essential importance to him and all of us, and which he or we could hardly hope to obtain without such potent and corporate representation. I trust when Election Day comes round, seeing that distinguished men have consented to serve on the Council, and assuming that they have done their duty thereon, this principle of securing them a permanent position there will be uppermost in your minds.

Occupying for the time the position I do, I feel that in what I have said I may be open to the charge of inordinate self-conceit, but this is not so. No one can feel more deeply and acutely than I do that with all the will to fill my position as I feel it ought to be filled, I fall far short of my own estimate, and that my whole real strength consists in being a unit of the strong and united Council you so wisely chose last June. In my office I have the highest belief—in myself the most humble doubt.

One other measure has been taken also, as I think, of much importance, and that is—the disregard of the place of domicile among our members in the matter of mutual subscription, in the far more large and worthy view both of the body and of its members individually, that the membership of the Institute, wherever enjoyed, so long only as those members were Englishmen and architects, was the object which all had in view, and conferred an honor which all desired. The actual amount of subscription cannot have, and ought not to have, any influence on this desire; and I trust and believe that, when this is appreciated, the consideration of greater or less opportunities of attendance here, and of consulting our Library, will be as nothing, while each and all—whether in London, or living in any part of the British Isles, our Colonies, or our Indian Empire—will feel it a privilege to contribute on equal terms with all other members to a body whose influence shall not be measured by their attendance in a meeting room, or whose knowledge by their opportunities of consulting a particular collection of books.

While referring to this subject it may not be out of place if I express a hope that in some way or other which the wisdom of the Council may devise, a more constant "rapport" shall be organised and maintained between the Institute and the non-Metropolitan members, by requesting their personal services in their own local centres in some official way. They would thus extend the influence and forward the interests of the Institute in their own localities, and in doing so work more or less in the same lines that we London men are striving to do with that object. I am sure the sense of usefulness would be pleasing to them and of much advantage to our common interest.

Although there are other measures arising out of this year's reorganisation of our constitution, I will not dwell on them in this Address, lest I weary you; but I felt that the three important changes to which I have adverted must possess such large interest to you all, as to render it proper and even necessary to refer to them as I have done.

I had hoped to have been able to welcome you on the first Meeting this Session in a Meeting room made more commodious than the present one; but the Council, having earnestly considered the question, felt that although with the sum already promised they might have begun the alterations, it would be more prudent to ascertain what additional rent our annual income would bear before they committed the Institute to an additional yearly charge. That only has delayed their action. The subject will be taken up, however, without delay, with a view to doing all that appears practicable, with the means at command; and these, I trust, will rapidly increase.

With reference to our numerical strength, I am glad to say that an increase of twenty has taken place in the two classes of Fellows and Associates since this time last year, they now number 635, against 615 at that time, exclusive in both cases of Honorary Fellows and the now abolished class of Contributing Visitors. This is not so large an increase as I had hoped to be able to announce, but as the increase last year (twenty-seven) was higher than the average had been for several years then past, I must be content to take our present addition of twenty members as an earnest of larger adhesions to our ranks during the coming year.

The Class of our Honorary Fellows remains the same as last year, but it is proposed, with your sanction, to add to it a name well known among us for many years and deservedly respected. The important services rendered to us gratuitously by our Honorary Solicitor for a long time, have naturally been frequently acknowledged, and the Council believe that they have only anticipated the desire that all our members will feel to offer to our old friend Mr. Ouvry the only acknowledgment which he could be induced to accept and which is at their disposal.

The Class of Contributing Visitors, nine in number, is now replaced by the new Class of Honorary Associates, whose names have been read to you, forty in number. Our friends of the

abolished Class will, I hope, accept and frequently use the invitation which has been sent to each of them to attend as before whenever they like, and if they no longer contribute to us in money, as they have heretofore done, we hope that their contributions intellectually and practically will still be at our disposal when they come here.

Our Library has increased in value during the past year, some fifty volumes (many of rare interest) having been purchased, while from our members in this country and abroad many donations have been received, among which perhaps the most important was a gift of no less than 130 volumes from Mr. P. C. Hardwick. About £40. in money has been this year added to the Library Fund.

The proposal of the late "Improvement Committee," and adopted by the General Meeting, to afford greater facilities to members and even non-members to refer to our really valuable collection of architectural, artistic, scientific and practical works, has been reduced to practice, and the Library is now open continuously throughout the year, with only a very short recess, and from 10 in the morning till 9 at night. The members of the Architectural Association, the architectural classes of the Royal Academy, and those at King's College and University College, now have access to our Library on a proper recommendation being made in each case from the respective authorities, at an annual fee of five shillings only. It is hardly possible to overstate the value of such a facility as this to the young, poor but clever student, or how many good architectural reputations of the future shall be due to the opportunities of reference and study thus afforded. The duplicate collection of useful text books for the purposes of lending out has also been begun, and any members having more than one copy of such works are invited to aid this object by sparing one copy to our library.

I hope our young architectural students will largely avail themselves of the opportunities thus afforded them; and, while on this subject, I would also direct their attention to the new classes lately formed in connection with the Architectural Museum for instruction in drawing and modelling from the valuable collection of subjects there, as well as from life models. The fees to these classes are so small as to be within the reach of almost every one, in consequence of the almost gratuitous services rendered there by the officials and instructors from their personal zeal and love for Art.

Our Income (exclusive of course of Trust Funds or Special Donations) has improved to the extent of nearly £100 a-year, now standing at £1805, against £1715 last year. This will of course be augmented during the current year by the increased subscriptions of members and by those of the Honorary Associates. I trust the increase will realise the hopeful anticipation of the Council, and enable them, without fear of deficiency, to proceed vigorously with the various objects we have in view, which involve a permanent annual expenditure.

During the year past, I think I may claim that the subjects brought under our notice, and on which animated and instructive discussions have taken place, have been at least equal in importance and interest to those of former years. Even when, as on one occasion, questions of a seemingly personal nature were mooted, the interest evoked did not become too zealous to be courteously expressed, and even the distinguished individuals who were named by the writer of the Paper to which I allude can hardly have felt more than momentary annoyance at his strictures, as they and we must remember that they were thus singled out from others by reason of their acknowledged eminence.

The Paper by Mr. Stevenson opened up a most interesting question, and one likely to agitate the architectural profession and their clients for some time to come. I will, therefore, ask your indulgence while I allude to this subject. While there can be no doubt of the talent of the

writer in humorous, good-natured satire and well-turned epigrams, yet that will not compensate for the absence of that sort of argument which convinces, and which shall lead the judgment and practice of the hearer to follow the advice of the author. The line of thought taken by Mr. Stevenson, and those who style themselves the "Preservers of Antient Buildings," seems to be that though architecture has confessedly, for as many ages as we have record of, been continually changing and adapting itself to the tastes and wants of the people, yet when we approach the particular epoch of Queen Anne's time they tell us we are to stay our hands, acknowledge that an Architectural Millenium was then at last attained, confess our absolute incapacity as artists, and suffer our old buildings—whether Domestic or Ecclesiastical—to remain untouched, however unsuitable to our requirements, in order that "a link of history" may not be lost. I do not hesitate to traverse this issue under both heads —the Æsthetical and the Practical. I will not admit that in an age when, in consequence of the vitality of that "Love, Reverence and Religion" (which are so pathetically said to have passed away), more study and real learning has actually been given to the production and judicious preservation of old buildings than for several preceding generations, and when more real work is done in one year than in ten years of former times, all that study and all that earnestness and all that work shall lead to no result creditable to our age. We living in it cannot, of course, presume to pronounce definitely on the comparative value of our work with that of those preceding or to succeed us: posterity must do that. But I venture to think that the works of a Scott and a Street, and of my own father, will tell a noble story of our time, and that it will need all the learning and patient study of the young men of the present day, to whose criticisms we have listened, to equal or surpass them. Nor can I, for one, believe that such result will be achieved to the satisfaction of posterity through the medium of that curious mixture of all proportion or no proportion, as it seems to me, called the "Queen Anne" Style, which seems just now to find so much favour.

These remarks apply to our domestic and public buildings; but how much stronger does the argument become when applied to our cathedrals and churches throughout the land. Surely in dealing with them we have no right to forget or ignore the original all-important intent with which they were erected, for which they were then well adapted, but now are often ill adapted, though equally needed, viz.: for the public worship of God. That originally was, and must still be, the primary—almost the exclusive—thought, far before æsthetical considerations or the idea so strongly urged on us that we ought to regard our churches as ruinous records or museums of the artistic ideas (good sometimes, but often very bad and hideous) of generations past. No: let us have some confidence in ourselves, and with all humility, yet without fear, deal with our old buildings, and especially our churches, as our forefathers in architecture uniformly did—adapting them, altering them, and even removing them altogether if thoroughly unsuitable to our needs; preserving their historical features with all loving care when possible, but subject as regards our ecclesiastical buildings to the above primary necessity. It is not too much to say that it is in consequence of such treatment by past architects that our old buildings have not lost, but largely gained, in interest for students; and so it may be I hope and believe with many of the restorations and adaptations of our time, taking them as a whole, to the students of the future.

My reference to Mr. Stevenson's Paper must not cause me to forget the real merit and great interest of other Papers of the past Session. That read by Dr. Schliemann on his wonderful discoveries at Troy and Mycenæ, and the discussion which ensued, showed how much of the student and antiquarian must enter into the composition of good architects. The Papers by Mr. Fergusson on the Erectheum; by Mr. Penrose, on the Optical Refinements of Greek Architecture, illustrate the scientific side of their character; while Mr. Lanyon's Paper on Sanitary Arrangements, and Mr. Morris's

Paper on the Proposed New Streets in London, illustrate the severe and minute attention to practical matters which is no less an essential to the architect.

I will close my remarks under the first head of my subject, viz.—*The Inner Life of the Institute for the year past*—by the mournful recital of those we have lost in that time, and by asking you in the following feeble record of their doings and their worth, to recognise at any rate our desire of retaining them in our memories.

SIR DIGBY WYATT (Past Vice-President).

Of our lamented Fellow and ex-Vice-President the late Sir Digby Wyatt it is not too much to say that his name occupies a position without any precise parallel in the history of modern British Art. I say of Art generally rather than of Architecture alone, because although he followed our profession with considerable success, it was his acquaintance with the history and development of Painting and Sculpture, in addition to his intimate and technical acquaintance with all those minor arts which have lately been brought to bear on the study of decoration and the improvement of manufacture in this country, that first introduced him to notice, and will conduce to perpetuate his memory.

Born in 1820, the son of a London magistrate, he was, at an early age thrown, in consequence of his father's death, on the care of his elder brother, Mr. Thomas Henry Wyatt, our late President, then a young man himself, and but just entering into practice. How admirably that trust was fulfilled is best known to private friends of the family who are old enough to remember Digby's youthful career. Suffice it here to say that he was sent to school, and, after the usual course of training in his brother's office, to Italy, where he pursued his artistic studies with a zeal and enthusiasm which will be long remembered by his contemporaries. He returned in 1846; and, after being employed on several minor works, was engaged in 1850 with Sir Joseph Paxton, Sir William Cubitt, and Sir Charles Fox, in organizing the Great Exhibition of 1851, the building for which was decorated under his partial superintendence, not only in Hyde Park but when it was re-erected as the Crystal Palace at Sydenham. In this undertaking, and on many other occasions, he was closely associated with the late Mr. Owen Jones, who then became his intimate friend, and whose death preceded his own by only a few years.

Among Sir Digby's architectural works may be mentioned the new India Office (for which he was associated as joint architect with Sir Gilbert Scott), the old East India Museum, and various other Government buildings entrusted to him as architect to the East India Board; the Crimean Memorial at Chatham, Addenbrooke's Hospital at Cambridge, and a Mausoleum at West Ham. In 1855 he obtained, with his brother, the first premium for Cavalry Barracks, in open competition, and Mr. T. H. Wyatt has since been entrusted with the erection of some of these buildings.

Sir Digby was employed in the restoration of several old family mansions, and in the design and erection of not a few new ones in town and country; among which Lady Marion Alford's house at Kensington Gore will probably be most familiar to our London members.

Of his literary and illustrated works there is, as you know, a goodly list, among the most important of which may be named his "Industrial Arts of the Nineteenth Century"—a handsome volume illustrating the choicest specimens of refined manufacture exhibited by different nations in the International Exhibition of 1851; while his interesting and beautifully illustrated treatises on mosaics, metal work, sculptured ivory and polychromatic decoration, are well known, are highly

valued, and have had, no doubt, a great and beneficial influence in promoting the excellence of industrial art in this country.

Sir Digby received the Royal Gold Medal from this Institute in 1866, and the Telford Medal from the Institution of Civil Engineers; he was a Chevalier of the Legion of Honour of France, and a Member of several Foreign Societies. In 1869 he was elected Slade Professor of Fine Arts at the University of Cambridge; and in the same year was knighted by Her Majesty. He died in May last year.

It is a delight to us all to have received to-night a portrait of our lost friend, which will recall his familiar features to those who personally knew and esteemed him,—and to those who are to succeed us and knew him not will identify the *man* with works which must be of lasting interest and value to architectural students.

EDMUND SHARPE, M.A. (Fellow).

The career of Mr. Edmund Sharpe, though less brilliant than that of Sir Digby Wyatt, was a very remarkable one, and, so far as architectural interest is concerned, very nearly as distinguished.

Mr. Sharpe started in life with an advantage which was, at the time of his youth, and indeed still is, rare among members of our profession: he had a University education; and it was at Cambridge that he first made his mark, by obtaining a Travelling Fellowship in 1832. It was, no doubt, this incident which determined his future lot, for, being obliged by the conditions of the award to devote himself for three years to some special study on the Continent, he selected Church Architecture, by the advice of Dr. Whewell, and travelled with that object in France and Germany. He does not seem to have been articled subsequently to any architect, but in after years he acknowledged with gratitude the useful information and practical assistance which he had received from that distinguished pioneer of the Gothic Revival, Thomas Rickman. For many years he carried on a successful practice in and about Lancaster in conjunction with his friend and relative Mr. Paley, a well-known Fellow of this Institute. In 1848, Mr. Sharpe published his important work, "Architectural Parallels," in which he carefully analysed the characteristics of 12th and 13th century architecture as exemplified in our Abbey Churches, specially as regards the peculiarities of the mouldings of the different epochs. This was followed in 1849 by his treatise on "Decorated Window Tracery," and in 1851, by his "Seven Periods of English Architecture," all well studied and valuable text books. At various subsequent periods of his life he contributed largely to the history of our art, and towards the close of his career again took up his pen to describe and illustrate Cistercian Monasteries. A work on the "Mouldings of Six Periods of British Architecture," and, I think, another work which he had in hand at the time of his death, remain, it is to be feared, incomplete.

With the devotion which Mr. Sharpe showed for all that pertains to the artistic side of our profession, it may well seem surprising that he felt inclination for pursuits of a widely different aim. Yet it is known, that for many years of his life, he was actively engaged in promoting and directing several railway works both in England and on the Continent, beside assisting in the establishment of tramways in Geneva. The town of Lancaster, which elected him its Mayor in 1848, has good reason to be indebted to him for the zeal with which he assisted in improving the sewerage and water supply of that borough, and though he modestly declined a public testimonial which was proposed by its inhabitants, his interest in their welfare never ceased, as was shown by his having taken an active part only a few years ago in the introduction of a local Bill then before Parliament.

But it is to the youthful students of architecture, some of whom may be in this room, to whom the memory of his good name will be freshest, and by whom it will perhaps be as much revered as by his early friends and *confrères*. The genuine pleasure which he took of late years in organizing expeditions to La Charente and other parts of France with his little band of followers—the extraordinary zeal with which he joined and directed their studies—the patience, the enthusiasm, the courtesy which he showed on those occasions, and the honest pride which he felt in the result of their useful work is known to many who hear me now, and will, I am sure, be duly appreciated by all.

I have only to add, that in consideration of his valuable contributions to the literature of our art, this Institute awarded Mr. Sharpe the Royal Gold Medal in 1875, and that one of the last acts of his life in connection with our Society was to make a Donation of £30. to be given away as Prizes to young architects, which the Council have determined to appropriate to a second Prize of £10. in the Pugin Travelling Student competition, for three years, to begin with the year ensuing.

T. TALBOT BURY (LATE VICE-PRESIDENT).

It is unnecessary for me to do more than allude to the serious loss sustained by the Institute in the death of Mr. T. Talbot Bury, our respected Fellow and late Vice-President, inasmuch as his intimate friend, Mr. T. H. Wyatt, at the Meeting of the 19th of March last, gave a full and interesting account of his labours, and alluded to him in terms of affectionate regard with which all here who knew him entirely sympathized. Mr. Bury was one of the oldest members of the Institute, having joined it as Associate thirty-eight years ago. He became a Fellow in 1843; was an earnest worker on the Council, to which he was elected on five several occasions; and was still actively labouring in your service as Vice-President up to the time of his lamented death.

CHARLES MAYHEW (FELLOW).

Mr. Charles Mayhew, who was elected a Fellow of this Institute in 1846, was educated for the profession partly in his father's office and partly in the office of the late Mr. West, who was officially connected with the works at Windsor Castle carried out under the superintendence of Sir Jeffery Wyattville.

On the completion of his articles he joined his father in partnership, and was associated with Mr. Thompson in preparing plans for the parish of St. James's, Westminster, as well as for the Crown lands in Whitehall, Regent Street, and Regent's Park. He was subsequently appointed Architect and Surveyor to the Parish of St. James. Continuing in practice after his father's death, he became District Surveyor to the same parish, an appointment which he held for many years. He was also Surveyor to the Westminster Fire Office, and in that capacity re-modelled the front of their premises in King Street, Covent Garden. In conjunction with his brother, Mr. George Mayhew, our respected Fellow, he designed and superintended the erection of a block of buildings in Coventry Street, as well as others in Ennismore Place, Prince's Gate, Kensington.—Sandhurst Lodge, Berkshire, was another of his works.

The latter days of Mr. Mayhew's life were unhappily clouded by a mental disorder which obliged him to relinquish his profession, and which terminated in his death. Happily, however, his private fortune had long since placed him beyond the necessity of work. He died a wealthy man, and being possessed of shares in the Architectural Union Company, in the formation of which he had taken great interest, he bequeathed those shares, amounting in value to some £120., to the

funds of this Institute. This bequest was only made known to us after the closing Meeting of last Session, and I take the earliest opportunity of announcing it to the general body of Members.

RAPHAEL BRANDON (Fellow).

The sad and sudden end of Mr. Raphael Brandon's life has been so recently announced, and the circumstances attending it are so painful, that I do not wish to cast a gloom over the evening's proceedings by any special reference to what is well known and I am sure deeply regretted by you all. I would rather allude for a few moments to the earlier part of a career, once full of hope and promise, and to the memory of a name long associated both in art and literature with the profession which it is our lot to follow.

Mr. Raphael Brandon served what may be called a double apprenticeship in architecture; first as the pupil of M. Dédeau of Alençon, and afterwards with Mr. Parkinson of London. Commencing practice with his brother, Mr. Arthur Brandon, just thirty years ago, he became an enthusiastic follower of the then rising Gothic School, and in the midst of his professional occupations found time to prepare and publish three illustrated works, which remain to this day interesting to the antiquary and valuable to the student of mediæval art. The first of these was published in 1848, "A Treatise on English Parish Churches," accompanied by plans and a letterpress description. The second was the well known "Analysis of Gothic Architecture," two quarto volumes, which appeared in 1849. The third was the equally familiar and widely circulated work on "Open Timber Roofs of the Middle Ages," published in 1850. Meanwhile Arthur Brandon, a young man of great ability, died, and his brother Raphael entered into partnership with Mr. Ritchie, a connection which extended over nearly twenty years.

Among the first buildings erected from his design and under his superintendence were the Church of the Holy Trinity at Leverstock, and the Town Hall and Corn Exchange at Colchester. But the most important work which he executed, and the one which brought him chiefly into notice as an ecclesiastical architect, was the Catholic Apostolic Church in Gordon Square. Of this remarkable building, which still remains uncompleted, it has frequently been said that it is a composition including many features more or less directly copied from old examples. But we must remember that it was begun at a period when the study of Gothic architecture was still immature, and when in the interest of our art it was better to copy correctly than to design with an originality which might not bear the test of criticism. Regarded as a whole the building is finely grouped, and is certainly one of the largest structures of its class that have been raised in London within our time. Among Mr. Brandon's later works were the Church of St. Peter in Great Windmill Street, and the Church of the Holy Trinity at Knightsbridge.

I must not forget to remind you that Mr. Brandon was one of the twelve architects invited to prepare designs for the new Law Courts, and that at an earlier period of his life he submitted a perspective design for the Nelson monument, which was the one originally selected for adoption, and but for some subsequent modifications on the part of the author might have been carried out.

Mr. R. Brandon's pen was occasionally devoted to other subjects than art, and in a pamphlet entitled "Railways and the Public" he advocated a scheme by which it was proposed that passengers should be enabled to travel any distance in England on payment of a uniform fare of one shilling—somewhat on the principle of the penny postage rate. Although never adopted, this scheme was seriously discussed at the time, and found many supporters. In private life Mr. Brandon is said to have been a quiet and unobtrusive man, who might have succeeded better in practice but for a highly nervous and sensitive temperament.

ROBERT L. ROUMIEU (Fellow).

The late Mr. R. L. Roumieu was a Fellow and ex-Member of the Council of this Institute. He served his time as an architectural pupil of the late Mr. Benjamin Wyatt, and for many years carried on a successful practice, at first as the partner of the late Mr. A. D. Gough, and afterwards on his own account. His ancestors were, I believe, of French nationality, and among the Huguenots who settled in England after having been expatriated from their own country. It was probably due to this circumstance that Mr. Roumieu was entrusted with the design and erection of the French Hospital in Victoria Park, and was appointed surveyor to the French Hospital Estate at St. Luke's. Among his chief works—of which a list is given in the *Builder* of July 7th, 1877—are, the Victoria Iron Works, Isle of Dogs; the Prudential Assurance Office, Ludgate Hill; East St. Pancras Schools, and several warehouses and business premises in the city. Among the country mansions which he designed or made additions to, are "The Cedars," "Fairfield," and "Hillside," Harrow Weald, and the "Priory;" the last erected for Sir James K. Bruce at Roehampton. He was also commissioned to lay out several estates in or near London. He is succeeded in practice by his son, M. Reginald St. Aubyn Roumieu, who, I understand, is about to present himself for election as an Associate of this Institute.

GILBERT R. BLOUNT (Fellow).

I regret that I have been unable to glean more than a few brief particulars respecting the late Mr. G. R. Blount, who was elected a Fellow of the Institute just twenty years ago.

He belonged to an old Roman Catholic family, whose name is well known in this country. Mr. Blount appears to have started in life as a civil engineer, and was one of Brunel's pupils. In this capacity he was engaged in superintending the Thames Tunnel Works when one of the floods occurred and he narrowly escaped with his life.

Mr. Blount was for some time in the office of our past Vice-President, Mr. Sydney Smirke. He was afterwards appointed architect to Cardinal Wiseman. His practice, as may be supposed, chiefly consisted of works executed for the community to which he belonged. The Roman Catholic Monastery near Dorset Square was erected from his designs. He was a gentleman of very courteous manners, and much respected among the friends who deplore his death.

Of our Foreign Members I have to record the loss amongst them of Karl Frederich Büsse, Wilhelm Zahn, and T. Stein of Berlin, and of Axel Nystrom, of Stockholm, the latter of whom died in 1868.

KARL FERDINAND BÜSSE (Hon. & Corr. Member)

Was a native of Pomerania, where his parents were small farmers. Their son, after receiving the general education common throughout Germany, showed unmistakeable aptitude for architectural study and pursuits, and was articled to an architect to learn the rudiments of his intended profession. In 1822 and following years he was a diligent student in the Architectural Academy at Berlin, and in 1827 he passed the stringent architectural examination there. Directly after he was offered employment by Schinkel, at first in a subordinate position and afterwards in one of trust, when his abilities soon led to his becoming publicly known, so that he became an important member of the Board of Works in Berlin. In 1849 he was named director of the Architectural Academy there, to which he gave a completely new organisation, and where he continued respected by all till his death in 1868.

His most important works were the Law Courts at Elberfeld and Windau; a large prison at

Moabit on the English system for separate confinement of prisoners; and a large public bathing establishment in Rehm.

Of the lives and works of the other above named foreign members of this Institute, news of whose decease has reached our Foreign Secretary during the year, no very definite information has been ascertained.

And now, gentlemen, passing to the second head of my subject, viz.: *The Outer Life of the Institute during the past year*, I naturally allude in the first place to the graceful recognition of the Institute by our Royal Patron the Prince of Wales. Having undertaken the post of President of the British Section of the Paris Exhibition, he has thrown himself into the work and duties of that position with a zeal and an amount of ability for which all who (like myself) have had opportunity to observe and admire feel most grateful to him. The Prince felt that, connected as he personally is with this Institute, he need only call on its members to aid him, so far as architecture was concerned, to the best of their power to ensure their doing so. The compliment intended by His Royal Highness to be paid to the whole body, by its President being placed on the Royal Commission, has, I know, been warmly appreciated by every member. It remains now, therefore, for us to show by the character, originality and excellence of the works to be sent to the architectural portion of the British Fine Arts Exhibition that the confidence thus placed in us by our Royal Patron has been justified. You are aware that a Special Committee of our members has been formed to carry out the necessary arrangements. A circular letter has been addressed to those who have been contributors to former exhibitions, and advertisements have been inserted in the public journals, inviting those who may not have been thus specially addressed to forward drawings of some of their best works executed by them during the last ten years.

At the last Paris Exhibition in 1867, there were, I find, forty-one architect exhibitors whose drawings covered a wall space of about 1000 feet. At the exhibitions at Vienna in 1873, and Philadelphia in 1876, the number of English architects exhibiting was very small, probably arising from the distance from England; but now that a larger, grander and more imposing structure than any preceding it, is being raised close to us to contain examples of all that is useful, interesting, instructive and enjoyable by the mind of man, I trust that English Art—including of course English Architecture, will be worthily represented and that the exhibitors will be more numerous and more talented than before, and that the wall space appropriated to us will be more ample and more worthily covered than even in 1867.

I may allude next to the application of the Local Government Board to this Institute to aid them with advice and suggestions on the New Code of Building Regulations, which has for some time been in course of preparation by the Board, with the hope and intent of introducing throughout the kingdom some general rules to be observed uniformly and to take the place of the confused and conflicting codes of regulation now in force, consequent on the absence of inter-communication of the numerous local Boards by whom these regulations have been issued. It will hardly be believed, but it is a fact that within a radius of 20 miles around the centre of Liverpool no less than thirty-four local Boards, each with a set of rules more or less different from the rest, are in force. The same confusion exists very generally to the distraction of architects who in all good faith and innocence find themselves often transgressing some of these local rules. There is good reason, therefore, for the proposed action of the Government Local Board, who deserve any assistance that can be rendered to them in their by no means easy task. The Council of the Institute at once met the request of the Board in the same cordial spirit, in which I am glad to say it was made. An

influential and hard-working committee was appointed, and when I mention that Mr. Whichcord was appointed its chairman, you will I know, be sure, that the committee did hard and useful work, and that their Report of advice on the Draft Bye Laws prepared by the Board, and submitted for the consideration of our committee, was eminently practical; endeavouring to give the public all needful protection in the due construction of buildings, public and private, without vexatiously hampering the action of professional men. That Report has been most gratefully and gracefully acknowledged by the Local Government Board, and many of the emendations recommended by the Committee on the original Draft, and many of their own suggestions have been adopted in the tentative "Draft Code of Bye-Laws for regulating Buildings," which the Board have lately issued. Probably before it receives its final shape, more if not all the suggestions made by your committee will find place in it. In the meantime those of us who are much interested in this subject, have found or can find a most able *resumé* of the Draft Code, and remarks on it, published in the pages of "The Architect" by our member, Mr. T. Roger Smith, and I would advise all to make themselves as much as they can masters of the subject.*

Again the advice of the Council of this Institute has been sought by the Royal Commission still sitting on the question of "Copyright in Design of Works of Art." The necessity of some kind of recognised law on this subject has long been felt by architects, for the custody of—and property in, their original designs—as embodied in their drawings, has, as you all know, been the subject of frequent painful disputes, which if contested in the Courts of Law would entail on the professional man (who is rarely wealthy) much mental vexation and considerable cost, whether he were or were not successful. The consequence is that a thorough confusion of practice exists. No actual issue has ever been tried out in one of the Superior Courts, where all arguments on either side would of course be exhaustively considered. I am glad to say the "Copyright Commission" fully realised how unsatisfactory this is, and admitted that architects had a case for protection. How that was to be afforded and to what extent limited, was felt by them, and indeed is a very difficult subject to settle; but it will at any rate be gratifying to the Institute to know that there is every disposition to treat the subject in a manner satisfactory to architects if the members of that Commission can possibly see their way to do so. The proceedings of the Commission are not yet complete, but it is hoped they will present their report this year. The Commission was presided over by The Rt. Hon. Lord John Manners, whose abilities and courtesy are well known, as well as his interest in architecture and architects, as is evidenced by his now enrolling himself as one of our new Class of Honorary Associates.

I must lastly advert to a matter which while the Council felt it was one on which it was only right that (as decreed by Parliament) the Institute should be consulted, was a most difficult matter to deal with in such a way as to justify the appeal to them on the question of taste and architectural fitness, without undue or arbitrary interference with the practical necessities involved. I allude, of course, to the submission by the Metropolitan Board of Works, under the Act authorising the formation of Northumberland Avenue, of certain designs for intended buildings to form its frontages. These designs had been prepared by the intending lessees, and sent to the Metropolitan Board for their sanction, previously to giving which the Board asked in each case the advice or suggestion of the Council. A long and careful correspondence (which has been preserved for future information) ensued—some of the fragments of which were separately commented on in the public papers,

* The Draft Copy of the Proposed Bye-laws, with the annotations of the Committee, is in the Institute Library, and can there be referred to by members.

sometimes from one view and sometimes from another—but looking all through it as a connected whole, I think the series will not be discreditable either to the Institute or the Metropolitan Board of Works. It will shew the high sense entertained by your Council of the importance and the difficulty of the work imposed on them by the legislature. It will also shew the strong cordiality of the Metropolitan Board of Works, and their desire to meet the æsthetical views of architects, subject only to their great duty towards the ratepayers, not to lessen the rent to be paid by lessees by reason of imposing too onerous conditions in the building agreements; indeed, this was their only difficulty in the matter. It was urged by the Council that consideration of the permanent appearance—satisfactory or the reverse—of large blocks of buildings in our finely laid out new streets, should be allowed to have no small weight, even if some pecuniary sacrifice should be made (a result they believed would at least be doubtful), and that the Metropolitan Board should remember the impossibility of correcting an error once made in such materials as stone and marble, however much it might be desired on all hands to do so when too late.

In the issue the Metropolitan Board required the lessees of the most important block in the whole avenue to modify their design to meet the views expressed by the Council. In this the valuable aid of the Superintending Architect of the Board was readily given, both to the Board and to the Council, with impartiality and with the best effect. Finally, although the Council could not give an unqualified approval even of the modified design, they felt that the Board at their instance had gone as far as they could be expected to do in requiring alterations which might seriously affect the expenditure of the man who was to pay an enormous ground rent, and expend a very large sum of money on the buildings, and they therefore passed the modified design, receiving an assurance from the Metropolitan Board that they would require that the treatment of the buildings on the adjacent ground not yet let should be consistent with such design. I have the authority of the Superintending Architect to say that since that time the lessee has frankly recognized the value of the suggestions made to him, and has agreed to some further modifications, likely to be improvements on the design so passed.

I hope, therefore, I may congratulate the Institute that while it was but too probable that the relations of the Institute to the Metropolitan Board under the above named Act of Parliament might have led to very unpleasant feelings between them, the reverse is the case; and I am induced to think that the aid and help of this Institute will in the future be rather sought than avoided by that important metropolitan body, who have so much in their power to make or mar the appearance of the London of the future.

I fear I may have wearied you by too long allusions to the above matters, but I think you will own that the facts to which I have alluded justify me in the observation I made at the outset of this Address, that this year of 1877 has been remarkable for the greater recognition of the Institute by Government and other public departments.

You will not forget that in the course of last year an animated correspondence took place in the public papers on the subject of "illicit commissions," as they were called, being commonly paid (as was alleged) to professional men by others than their clients, and without their cognizance or consent. The charge was made indiscriminately against men of various professions, and among them against architects. I felt it a duty to combat the truth of this charge against us, and especially as regarded the members of the Institute, the primary object of which as we all know is to preserve and continue "purity of professional action" by every means in its power. The general body fully endorsed more than once all that I had written publicly in their behalf, and I cannot doubt it will be their desire to show their earnestness in any way that may at any time seem feasible. With this

view some communications have taken place between your Council and Sir Edmund Beckett, who has proposed a bill to the House of Commons which shall inflict a sensible penalty as well as affix a stigma of dishonour on all who might be proven guilty of such practices. That bill was introduced too late to become law last session, but is to be pushed forward this year. Sir Edmund has informed me that it has the full sanction of the law officers of the Crown to whom it had been referred by the Home Secretary, and this Meeting will be glad to hear that so far from making the charge so general as he and others certainly did in their correspondence in the public papers, he desires it to be understood that so far as he is concerned he does not wish to say or imply that it is *common* with architects, though he is aware of some instances of those who called themselves by that name having adopted this dishonest practice. This being so, it is evident that the objects of Sir Edmund and the Institute being identical they can work cordially together, and your Council will I am sure have your full assent in considering any well devised scheme whereby the honest men shall be relieved from calumny, and the dishonest men be exposed as they deserve.

Many subjects of great practical interest to architects will no doubt engage the attention of most of us during the coming year, among which I may specially mention the "Metropolitan Streets' Bill" of the Metropolitan Board of Works, and the project for the better supply of drinking water to this huge and still increasing city.

The question of the extension and concentration of our public Government offices is likely again to become prominent this year, and a Report on the subject by a committee of the House of Commons has been published, which I would commend to the attention of our members, and especially as regards the evidence of the witnesses called before the committee, which deals in several places with the question of so much interest to us, viz. whether, in the interest of the public, architects of acknowledged experience and with full public responsibility for their works should not be employed on our public works, rather than they should be entrusted to the unknown talent, without any personal responsibility, of some salaried officer of a "department," who, as one witness very pertinently told the committee, would on his discovering his own talent to be of a superior order soon give up his salaried official position for an independent one with all its risks, but also with the incentive to exertion and aid to talent that all feel when a creditable result is publicly acknowledged and identified with *the man* who has achieved it. It is to be regretted that the Committee had only one representative of our profession before it, Sir G. Gilbert Scott, in addition to the surveyors to the Crown, of the office of Woods and of the office of Works. The Committee do not recommend any specific action in detail, contenting themselves with pressing on Parliament very strongly the absolute necessity of something being done at once to remedy the serious inconvenience and risk arising from the present system of housing our public officers in separate private houses, often small, unhealthy and divided from each other. Let us hope that should a public competition take place once more (as is not improbable) the subject of which shall be to deal with the question as a whole, the miscarriage and injustice of action which followed a similar competition in 1857, and which I have such good personal reasons for remembering, may be avoided.

We may, in conclusion, turn our attention for a few moments to the further progress of work in classic lands, to which I made allusion in my Address last year. I need not further allude to the extraordinary and most interesting discoveries of Dr. Schliemann at Mycenæ and Troy, for you have heard them described in this room by the enthusiastic discoverer himself. After having carefully prepared for publication a full record duly illustrated of his discoveries, the Doctor has returned to the scenes of his labour, and is still sanguine of finding more and more proof in support of the theory to which

he has committed himself, as to the age and destination of the remains unearthed by him and Mrs. Schliemann. As he has now become one of our Honorary and Corresponding Members, he will, I am sure, feel it a pleasure to recognise the claim the members of the Institute thus have to be taken into his confidence from time to time should new wonders be laid open to the day.

Other researches in Greece have been proceeding, as for instance at Olympia, and though the past year has not revealed anything very new there, all that has been found has tended to confirm the knowledge previously gained. At "Spata," in Attica, a tomb has been discovered, containing many gold ornaments, which are supposed by some to be of the same epoch as those found by Dr. Schliemann at Mycenæ. At "Dodona," a number of inscriptions have been discovered, though no works of art of importance. We may see, therefore, that the spirit of research for all and everything that may throw light on the history or legends of that land, at once the birth-place and centre of all early refined art, is actuating many a zealous explorer, and year by year we may confidently hope to add some little to our stores of knowledge on this most enticing subject of enquiry.

I cannot pass on without some allusion to another work of exploration of the greatest interest, and which has been pursued and persevered with under much difficulty and disappointment. I allude to the "Palestine Explorations." It was early felt that before exploring particular spots in detail, it was almost essential to have a far more correct map than existed of the whole of the country both east and west of the river Jordan. The east side was undertaken by an American committee, who have not, however, made much progress. The west side was undertaken by our own countrymen, and an excellent map has now been nearly completed, after a persistent labour of some years. A tract of country of 7340 square miles has been accurately surveyed—the hills shaded on the spot—on a scale of one inch to the mile; and the map, as accurate as Ordnance maps are, is the gratifying result. The sites of about eight times as many places have been identified and marked on it, as are shown on the most correct maps previously existing; while, in addition to the land survey thus made, careful measurements have been taken and drawings made of a large number of architectural ruins, of all ages, the greater part of which have now been seen and measured for the first time.

As the American society has made little or no progress, I am informed that, should their funds enable them, our own "Palestine Exploration Committee" will now commence a similar map and record of the country on the east side of Jordan.

The extremely interesting excavations by Lieutenant Warren, undertaken also at the instance of the Palestine Committee, have been obliged to be suspended for the present. They were, however, so very promising, and they had already afforded so much curious information, that it is to be hoped they may be resumed.

With regard, therefore, to all those labouring in distant lands in matters of such great interest to us here as architects or archæologists, and remembering how earnestly Dr. Schliemann assured us that one of the greatest incentives an explorer can have is to feel that he is not alone, but has the interest, regard and good wishes of sympathizers all over the world, I may, I am sure, as last year, on behalf of this Institute, wish "God speed" to all who thus are labouring abroad.

And now, gentlemen, before closing what I fear has been too long an Address, there is but one word more I wish to say, and it is that it will be well for us in the Papers to be read in this room very often to choose subjects of thoroughly practical character. A charge is frequently reiterated (though as often contradicted) against architects that they think too exclusively of the artistic

effect and external beauty of their buildings, and disregard partly or altogether the important questions relating to the health, comfort and convenience of those who are to live therein. I recently heard a noble lord in a public address made by him roundly assert that architects were "ignorant" of all these matters:—alluding to questions of ventilation, warming and drainage. You will know how unfounded this really is. Again, the City Librarian said the other day that the banes of libraries were architects and the gas. It was indeed well said in reply to him, by a kindly non-professional defender of the architect, that if those who were about to build libraries or other buildings really knew their own wants, and could intelligibly explain them, there would be fewer of such complaints. This is perfectly true. The undeserved blame for all the mistakes of clients—their imperfect perceptions—their non-power of realization of their requests (which nevertheless the architect is bound to attempt to comply with) are heaped on the devoted head of the unfortunate architect. We cannot I know expect this state of things suddenly to alter in our favour, but we may learn from our detractors a lesson of Christian submission to unmerited blame, and also learn how needful it is in these days of extensively diffused scientific knowledge and scientific enquiry to pursue exhaustively our enquiries into these scientific and practically important subjects, and to do our best to put ourselves in a position to challenge our accusers to the proof of their assertions from any buildings erected under the care of architects of experience, when they have been treated with due confidence by their clients. Let us welcome, then, the discussion of these matters, and it may be we shall do more thereby to add to the power of the architects of the next generation, to carry out large works —beautiful works—and works distinguished by their sanitary excellence, than we ever can by the more exciting discussions whether architecture attained its maximum excellence in the thirteenth century or in the days of Queen Anne.

I have now only to thank you for the great patience with which you have listened to me, and to promise you once more that anything I can do for the well-being of the Institute shall cheerfully and zealously be done by your President.

Sir G. Gilbert Scott, R.A., Past President.—Mr. President and Gentlemen: I hardly know whether I ought to address you Sir, or to limit myself to the company, as my object is to ask them to return their best thanks for the Address with which you have favoured us. But I have an apology to make to you personally for not being quite in good form for the discharge of such a duty as to return thanks for his remarkable and comprehensive Address. I think the company at large will not require any apology for that, for if I were able to traverse your Address as it ought to be done another evening would be required. I will therefore limit myself very much to begging—and that is needless—that our most hearty thanks be returned for the wonderful pains you have taken in this Address. The year has been remarkable for the number of subjects brought before us. The whole Institute has undergone reorganization and absolute change in some respects,—not quite so great perhaps as were apprehended, but nevertheless requiring care in some particulars, and many perhaps will rejoice that the alterations have not been so great as were intended. Still, they have been extensive and important, and you have laid before us in general view all the principal changes that have taken place, in a most masterly manner. Indeed, the one thing which has astonished me in your Address, besides the immense industry and ability which it displays, is your power of dealing with such an endless list of subjects in so limited a space of time.

I will not venture in any degree to traverse what you have said. Still there are two or three things which should not be passed over in silence. You have very properly congratulated the Institute on some of the changes which have taken place. As far as I know, though my experience

has not been great in that respect, the Institute under your guidance has organized a most excellent Council, which has worked admirably and to your satisfaction. So strongly have you spoken on this point that you seem willing to merge your individual existence as President in your corporate existence as a member of that Council. I do not, however, think the members of the Council will be disposed to agree to this, though you could not have paid them a greater compliment. The next thing is the remarkable list of candidates for the new class of Honorary Associates—42 in number; and from what I have been told they are men of the highest position and rank, who will be the greatest possible acquisition to this Institute. On important occasions, when interesting discussions have taken place, we have very often indeed had visitors who have contributed most admirably and most extensively. I should occupy you too long if I commented upon those who have helped us beyond description in our discussions. You have said rightly that these gentlemen coming to us, will learn much from us; we may say with equal truth we have learned already, and shall continue increasingly to learn very much indeed from them.

In speaking of our President himself, I may say that *he* is not one of the results of our reorganized system, but rather a relic of the past; and I think we all agree that his election reflects great honour upon the old Council and Constituency, who with such general concurrence of opinion made choice of him; and I doubt whether their successors will do themselves greater credit than they did on that occasion. Your observations, Sir, about the provincial members are very encouraging—I refer to the enthusiastic feeling you have attributed to them, and I sincerely trust their enthusiasm will be kept up to the mark.

Then we get to the long and melancholy list of our deceased friends. We have all felt these grievous losses! My dear friend Digby Wyatt!—my dear friend Edmund Sharpe! I think all of us have said what little occurred to us at the time of their death, and I am sure that that little was accompanied by a very great amount of feeling. Poor Talbot Bury! You omitted by-the-bye to say that he was a pupil of the elder Pugin and a fellow-pupil of the great Pugin. Then there is poor Raphael Brandon! of whom I cannot think without distress. A better-hearted fellow did not exist, nor a more devoted follower of that branch of architecture to which he was devoted. Why so earnest a man should have been visited with such griefs, such disappointments, troubles, and blighted hopes, Providence only knows!

I will only add the expression of my great pleasure at hearing that our excellent friend Mr. Ouvry has consented to receive the only compliment which we can pay him, and which he ten times and a hundred times over deserves. On the subject of church restoration, I will only say that our President goes far beyond me—and that I doubt whether my sentiments do not approach more nearly to those of the Society than to his. I may say much the same of his remarks on Good "Queen Anne." I confess I rather like her: anyhow, "*de mortuis nil nisi bonum.*" I again ask you, gentlemen, to express in the strongest manner in your power our thanks to the President for his excellent Address.

Mr. Thomas Henry Wyatt, Past President.—I had hoped that our Past President, Professor Donaldson, would have been here to second the proposition of Sir Gilbert Scott. At this late hour I will add very few words, but I am anxious personally to express my great admiration at the energy and labour you must have bestowed upon this Address. One of the great charms I feel in it is that it shows the immense personal interest you have taken in the welfare and prosperity of this Institute. You have made it another child of your own. I had thought your own family was large enough, but you have made this another child; and I would further express my great approval and admiration of the way in which the Council have managed the external affairs of

the Institute, and the better relations we hold with foreign and government bodies. I am sure the Meeting will cordially endorse all that has been said.

Mr. J. WHICHCORD, V.P.—Although late in the evening I should hardly like this vote to be passed, as I am sure it will be unanimously, without having an opportunity of supplementing by a word or two the remarks that have just been made by Sir Gilbert Scott and Mr. Wyatt. Both those gentlemen have borne testimony, as they are well capable of doing, to the care which you, Sir, have obviously bestowed upon the Address just delivered, but they have not had the same opportunity your colleagues on the Acting Council enjoy, of knowing how thoroughly and constantly you, as President, have devoted your valuable time to all the minute details of the work of the Institute, and although the Address may and does illustrate the broad and comprehensive views you take of questions which interest us, it in no way conveys the pains-taking labour you have given throughout in matters of detail. There are one or two points to which I desire very briefly to allude, in order that the Meeting may judge of the effect which has already resulted from the scheme of re-organisation consequent on the Report of the Committee for the Improvement of the Institute last year.

Firstly, the more than usually weighty matters that have been dealt with by the Council, comprising the reference as to the code of model bye-laws by the Local Government Act—the negociations with the Metropolitan Board of Works in respect to the Northumberland Avenue, the Paris Exhibition, the Report of the Committee of the House of Commons upon the Public Offices and Buildings, with sundry other subjects of prominence.

Secondly, that which I look upon as one of the crucial points of our recent change, the establishment of the new class of Honorary Associates; and thirdly, the effect of our new rules upon those of our members who do not reside in London and have heretofore been called Country Members. Upon the first point I think the simple enumeration of the work that has so soon fallen upon the Council is evidence that the honour of a seat thereon is no sinecure office, bearing in mind that the subjects they have had to deal with are not merely questions of routine, or of artistic or archæological discussion, or even professional points of practice, but grave and responsible questions affecting not only the profession of architects but the interest of the general public. Some of these labours have been satisfactorily concluded, as you have pointed out in your Address, but others such as the House of Commons Report on Public Buildings and the proposed Water Supply of London are still under consideration.

On the second point I trust the Meeting will go with you in the expression you have given to the satisfaction you feel—the creation of the new class of members—upon the success of which I remember much doubt was felt by many in this room not long ago. It was by some members considered doubtful whether a sufficient attraction was presented to induce gentlemen of high qualifications to enrol themselves in our ranks and come amongst us with a title which was thought not perfectly expressive, viz. that of Honorary Associates, but which the President's Address sets at rest this evening on the supreme authority of Dr. Johnson. I venture to congratulate the Meeting upon the present aspect of this new class of members, not only upon the number of candidates we have up for election at this early period of the Session, but also upon the weight and character of those who compose the list. It is indeed numerically large, and in it we have representative men from both Houses of Parliament and the Judicial Bench, eminent barristers and men of science, together with a goodly array of Royal Academicians, some of the most prominent members of the Institution of Civil Engineers, the Royal Society and Society of Antiquaries. I venture to say this is a very hopeful state of things, and that the creation of the new class of members must be looked upon as a successful movement, and inasmuch as the 40 candidates in question have been introduced by only a very few

members, if the Institute generally will set heartily to work, there ought to be little difficulty now in increasing the number of Honorary Associates to the satisfaction of the greatest optimist among us.

I think the Meeting ought to know that which the President's characteristic modesty has not disclosed in his Address, viz., that a large proportion of the list of candidates nominated as Honorary Associates is due to his personal influence. If it commends itself to the views of the members in the same sense as it presents itself to my mind, the introduction of the new class of Honorary Associates is an element of the greatest value and importance to us. The association of a body of gentlemen interested in our work, and bringing to bear upon our proceedings their experience in the cognate arts and sciences, as well as the learning and experience of others, must add greatly to the power and usefulness of the Institute.

As regards the increased subscription of those who were formerly known as Country Members, the President's Address dealt conclusively; and I trust those of our members who do not reside in London will feel that the abolishment of the invidious distinction which has hitherto prevailed between country and town members, as well as the increased weight and importance it is sought to give to each class of membership, wherein henceforward every respectable practitioner in the country will feel he must, if possible, be included, will commend itself as a very ample equivalent for the additional subscription he is asked to contribute to the funds of the Institute. In addition to this, I am sure I am not guilty of any indiscretion when I assure our members who are affected by this change, that the Council have every desire to give members who reside in the country additional advantages, and that the subject is now under consideration; and I hope shortly some definite suggestion will be made upon this point advantageous to the Institute and satisfactory to those of our members who do not live in London.

The Vote of Thanks was then put by Sir Gilbert Scott, and carried by acclamation with loud and protracted applause.

The PRESIDENT.—Gentlemen, you have heard so much of my voice to-night that I will not inflict a second speech on you. It is quite unnecessary for me to do more than tender you my best thanks for the acknowledgment of my services which you have so kindly made. I acknowledge that it does take time and trouble to do the work of my position, but that is all cheerfully given; and if it is appreciated as it always is kindly by you, I need no other reward.

The Meeting then adjourned.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday, the 19th of November, 1877, Mr. Charles Barry, President, in the Chair, the following Paper was read—

ON MIDDLE-CLASS HOUSES IN PARIS AND CENTRAL LONDON.

By William H. White, Fellow.

Mr. President and Gentlemen,—That a writer or a speaker who presumed to address his colleagues, or even the public, should have some personal as well as studious acquaintance with the subject of which he treated used to be more than an axiom; it was a self-evident proposition. But the great perfection to which the art of public writing has attained, the means now at everyone's disposal to diffuse information, and the consequent development of general knowledge—not to mention the exigencies of rapid journalism—permit men to describe, often with accuracy, things that they have not seen; and to discuss, sometimes with advantage, subjects which they have not had occasion to appreciate. I prefer the earlier custom; and I would not venture to call the attention of the leading Architectural Society in this country to the matter of House Accommodation in Paris, were it not a subject which, I humbly think, no other English member of our Institute has had an equal opportunity to study. During a residence of ten consecutive years in middle-class Paris houses, I have seen many hundred similar buildings rise from the vaulted cellars on which they rest to the mansarde which crowns them. I would therefore invite an examination of the method employed in Paris to house groups of people of different denominations upon one and the same restricted area of ground; to combine in a single block shops complete in themselves and distinct houses each complete in itself; to enable the lower storeys of a building to be occupied by business people who reside away from their shops and offices, and the upper storeys to be inhabited by families without confounding them with the tradespeople, or confounding one family with the other; but, on the contrary, housing all the tenants in distinct groups, and in a manner conducive to their mutual advantage.

To many people the title of this Paper may shadow forth a treatise in several volumes, for the middle classes, both in Paris and London, are as ubiquitous as the houses in which they dwell are varied and dispersed. Indeed it is hardly politic to define a middle-class family. In Paris, as in every other European capital, a few of the middle classes occupy more sumptuous houses than their fellow citizens of birth and distinction. In London the younger son of a peer may now hold a commercial position inferior to that of an eminent tradesman who represents a county or marries a duke's daughter. But the grades of a town population to which I would chiefly refer consist of people who in every phase of general society live, like the ideal hero of the Latin poet, between the little and the great—all those who, amid the organised clamour of working men and the optimism of dull prosperity, can neither gain the sympathy nor excite the cupidity of reform.

THE *MAISON-A-LOYER:* ITS ORIGIN AND GROWTH.

That the Paris houses, to which I refer, are entirely different in methodical arrangement and mode of construction from any in Central London I need hardly insist; the principle of plan which governs them is based upon the Roman custom in vogue even during the time of Cicero, and brought in the second and third centuries to systematic elaboration—elaboration which could never have reached a character other than comparatively primitive. But that two classes of domestic buildings were recognised in Rome as early as the close of the first century is known, I think, beyond a doubt. There was the *domus* intended for the accommodation of a single family; there was also the *insula* or island of clustered shops and superposed dwellings. Incidents connected with the Roman mode of habitation are recorded at intervals up to the time of Palladio, when even noblemen who dwelt in the heart of an Italian city sometimes devoted the ground storey of their palaces to shops and shopkeepers' dwellings, whereby they obtained a by no means despicable revenue. In parts of France, even before Palladio's time,—obviously in the great cities,—houses were sometimes approached through a broad passage bounded on either side by shops let to different tenants who had no connection with the superstructure of which their shops formed simply the ground storey. Scotland, whose relations with France in the sixteenth and seventeenth centuries were more intimate and practical than then existed between the southern counties of England and the provinces of Normandy, Flanders, or Picardy, adopted some of the customs of, at that time, a superior form of civilisation. Thus Edinburgh which, according to an English traveller in 1598, consisted principally of "one broad and very fair street," was inhabited on the French system. Both gentry and tradesmen resided in the High Street, but not as in English towns beside each other; the houses of the gentry were behind and above those of the shopkeeper, whose business compelled a monopoly of the street frontage at the ground level. Another traveller at the very beginning of the seventeenth century said that "in the High Street the merchants and tradesmen do dwell but the gentlemen's mansions and goodliest houses are obscurely founded in the aforesaid lanes." Having some doubts whether the ancient distinction between houses arranged for several families, and those arranged for one only, existed as early as the sixteenth century, I wrote to the late Mr. David Bryce, a distinguished member of our profession and a Fellow of this Institute: I received his assurance that on the different storeys of many old houses were shields of arms indicating the position in society of their occupants. "It seems," Mr. Bryce wrote, "to have been the rule all over the Old Town; and there were immense blocks, of the end of the sixteenth century, thirteen storeys or flats high, each flat a large house."* Nevertheless those flatted houses cannot be regarded as superior, except in size, to the Roman *insulæ;* the various storeys were simply composed of rooms leading one into the other. The same must be said of similar houses in Paris about the beginning of the seventeenth century; and, indeed, until far into the reign of Louis XIV. Germain Brice,† in his description of Paris, about the close of the seventeenth and the beginning of the eighteenth centuries, said there was no spot that was not inhabited and entirely filled up with houses in which were found

* Mr. Bryce's letter, written not long before he died, continued:—"Where this is not the case the occupants were known, such as Cardinal Beatoun's, but that was a palace, and only of three flats, with a courtyard behind. There were many such at one time, many of the houses in the Closes also being known to have been self-contained, but these were not the lofty flatted houses so characteristic of Old Edinburgh. Of course these houses show the value of space in a walled town, and also account for the quaint projecting wooden fronts which were almost invariably additions to a finished stone house." Edinburgh, November 4th, 1875.

† Brice (Germain). "Description de Paris," 2 tomes. Paris, 1700. 12o.

many families together. He also mentioned certain houses of seven storeys in the neighbourhood of the Palace of Justice and of the Market; in them the least spaces were occupied and let very dear. About the same time, in 1698, Dr. Lister visited Paris, and he wrote that during the preceding forty years a new town had replaced the old one; houses built of brick and stone had given place to others constructed of stone only. Everywhere, said he, the houses were lofty and majestic; those belonging to persons of quality had carriage entrances leading to internal courtyards, and it was estimated that more than 700 of these great gateways then existed in Paris. Those hôtels—that is to say, private mansions—were principally situated in the neighbourhood of Notre Dame and in the Faubourg St. Antoine; but less than forty years after, another transformation had taken place. Fashion flocked westward; the old hôtels were divided and subdivided; new private houses for the nobility and gentry rose in the Faubourg St. Germain and its neighbourhood. It was during the closing years of the reign of Louis XIV. and the commencement of that of Louis the Beloved, that a vast number of houses, specially arranged to hold several families and groups, were planned and erected. Voltaire, about the middle of the last century, signalised the improvements he had seen effected, saying that in his time it cost no more to be agreeably lodged than it cost to be badly housed during the reign of Henri IV. One or two elevations of the *maisons-à-loyer*, erected about the period when Voltaire wrote, are given in the "Motifs Historiques" of our Hon. and Corresponding Member, M. César Daly.* Blondel, in his "Cours d'Architecture," published in 1772, gave several elevations of such houses, but pointedly refused to publish any plans of them. The architect, Patte, writing just before the Revolution, has left a valuable note respecting the progress he had witnessed, and indeed aided. "All those agreeable arrangements," said he, "that are now admired in our modern mansions, in which the apartments are separated with so much art—those back staircases which render domestic service so easy—have only been invented in our time;" and he adds, "it was at the Palais de Bourbon† in 1722 that the first attempt of the kind was made, which has since been so frequently imitated." Though Blondel's engraving of a *maison-à-loyer* erected in 1719 is not unlike, externally, similar buildings which rose in Paris nearly a hundred years after, the internal distribution of such a house has principally developed during this century; and its form was borrowed imperceptibly from the hôtel in which a noble family lived, often in separate apartments.

How in the course of the last two hundred years the *maison-à-loyer* has grown may be seen by a comparison of the illustrated books which have been published during that period. A series of model plans and elevations made by Pierre le Muet‡ and first published in 1663, contains houses of every variety of frontage and depth. Therein, I venture to believe, may be seen the lines of the typical London house erected since the Great Fire, and the typical Paris house of to-day. Pierre le Muet's elevations accord with illustrations of Paris to be found in a book by Charles Perrault,§ printed in 1670. But Pierre le Muet's designs are for houses to accommodate a single family. In one,‖ however, arranged to cover a plot of land about 40 feet wide by 100 feet deep, it will readily be seen with what facility the different storeys could be divided into distinct sets. It

* No architect who studies the Parisian system of House Accommodation can honestly omit to mention the assistance he has received from M. Daly's numerous works upon the subject. Moreover, I am specially indebted to him for private letters, and for references to French books of the last two centuries.

† The building in which, until the Siege, the meetings of the Corps Legislatif were held.

‡ Described in English books of the time as "Architect to the French King."

§ Perrault (Charles). "Courses de Festes et de Bague, faites par le roy et par les princes et seigneurs de sa cour, en l'année 1662." Paris, 1670. fol. It was this carousal which gave the name of Place du Carrousel to the quadrangle of the Tuileries.

‖ Le Muet (Pierre). "Manière de bien bastir." Paris, 1663. fol. "Distribution de la septième place." p. 24.

is only, comparatively speaking, a small hôtel built with party walls on either side and with the front building brought forward to the street alignment. The depth of 100 feet is divided into four parts: two of construction and two of open space. That is to say, first a block of buildings with windows front and back, then a courtyard, then another block, and then a garden. The two blocks are connected by a narrow building which contains the staircase; and thus the courtyard is surrounded on three sides only. The frontage of 40 feet is in three divisions; there is a wide passage in the centre, to the left of which is a stable and to the right a kitchen. The entrance door to the house is in a corner at the end of the courtyard. On opening this door the staircase is immediately in front; to the left is a lobby leading to two sitting rooms. To bring the dinner and supper into one of these rooms from the kitchen it is necessary to cross the open courtyard, and the only communication between the latter and the garden is through the sitting rooms. The discomfort or inconvenience of such an arrangement—the evident confusion of the family and their servants, especially at a time when the latter were very numerous—is what Patte referred to, more than a hundred years after, in the quotation I have made; for the larger hôtels of the time were not more scientifically planned as regards the service. To continue the description of Pierre le Muet's design: on the first floor each block contains a set of rooms; the door of each room opens into a lobby or hall which is approached through a single door communicating with the central staircase. In the block facing the street the set of rooms consists of a small study (*cabinet de travail*), a bedchamber, and a dressing-room (*garde-robe*); in the block between the courtyard and the garden the set consists simply of a bedchamber and a dressing-room. The small room called the *garde-robe*, the invariable appendage of a bedchamber in the time of Louis XIV., was used not only to hold the wardrobe but often a servant's bed; it contained not only the small bason and jug, for which a complete washing apparatus has lately been substituted, but also that *chaise-percée* which spared to the Great Age any complication of pipe or drain. The same distribution of plan is repeated on the second storey, and thus an almost patriarchal system of habitation could be pursued. One set of rooms was occupied by the chief of the family; his married daughter, say, occupied with her husband another set; the eldest son another; the younger children another, and so on.* When fifty or a hundred years after, this house was relinquished by the family of its original owners and probably builders; when perhaps it fell into the hands of a speculator, nothing was easier than to apportion the different storeys in either block to different tenants. The staircase common to the various groups of one great family was no less suitable for groups of several less distinguished families; the outer door of the lobby belonging to each set of rooms became the entrance to a small house. The kitchen and the stable facing the street were converted into shops, the small larder between the stairs and the kitchen became a porter's lodge. By a further subdivision of the different sets of apartments it was easy to add a small kitchen to each. No radical improvement upon the kind of house I have attempted to describe was made, as far as I can ascertain, until after the Revolution. A great deal of progress then took place, and judging as I do simply from his writings, I think the learned architect, Patte, must have largely contributed to that progress, from the many practical suggestions he published. That progress has continued in Paris up to the present hour, in spite of wars and sieges, in spite of the worst disasters; and an architect of any experience in French domestic buildings can trace through the reigns of Napoleon, Louis Philippe, and the late Emperor, the ameliorations which have been introduced into the house of the middle classes. From the staircase specially devoted to the service,

* A few old hôtels in the Place Vendôme, for instance, are still inhabited in this manner; others in the Champs Elysées and the new Boulevards have been specially arranged for a similar mode of occupation.

an innovation of this century only and now the invariable adjunct of ordinary houses, to the hydraulic elevator, which is an innovation of barely ten years ago, the gradations of development are distinctly marked.

THE *MAISON-A-LOYER* AS IT IS.

Organisation.

I have pointed out the peculiarities, at least to an Englishman, of a Paris house erected more than two hundred years ago. Upon the wall are plans* of a block of shops and houses built in one of the newer quarters of Paris some forty years ago; it may be considered typical of the houses which rose during the reign of Louis Philippe, and its development from Pierre le Muet's model is not difficult to perceive. On the wall also are plans* of a corner block situated on the Boulevard Malesherbes and certainly not older than fifteen years. The plans speak for themselves, and I need merely describe one of many ordinary blocks as I remember them during the last ten years of the Second Empire. Take, say, one near the middle of the Champs Elysées, in a bye-street and with a shop at the street level. The shopkeeper perhaps simply uses his portion of the building as a place of business; he inhabits with his family elsewhere. The houses are built round three sides of a courtyard, the fourth side being open to the courtyard of the adjoining house—a division wall existing only to the height of the ground storey. In the courtyard are stables and coach-houses used perhaps by the tenants of the principal floors. The approach to the courtyard is under an archway through a passage about 10 or 11 feet wide; and the entrance to the principal stairs is in that passage. Thus carriages deposit their occupants under cover at the foot of the stairs. Commanding these stairs, as well as the courtyard and the carriage entrance, is the porter's lodge consisting of two small rooms. At the further end of the courtyard is the entrance to a small staircase, used exclusively by the servants and tradespeople; and I may add that the improvements recently made in the size, shape, and lighting of the servants' stairs were eminently needed. The same criticism does not apply to the principal stairs, which are even more commodious and easy in the old houses than in the new. These stairs are generally of polished oak, and, unlike polished oak in this country, it is usually kept polished. Each storey above the ground floor forms one house, the private entrance to which is on the staircase landing of each floor; and the distribution of rooms in each house is the same. It consists, say, of eight rooms exclusive of dressing-rooms, a kitchen, and a square hall, or, as it is called, an antechamber. Into this hall open the doors of the dining room and the drawing room; also a door leading into a passage communicating with a morning room and with two bedrooms; and on the other side of the hall is a door leading to the servants' corridor, between which and the hall are the doors of two more bedrooms. One room with a cupboard and perhaps a small larder are all that is devoted to the kitchen. Thence a door leads directly to the back stairs, which form the only communication from the very top to the very bottom of the house—from the cellars in the basement to the servants' bedrooms in the roof—for to each house are allotted two vaults below and two rooms above. If therefore five different families occupy the five floors of the house, most of their servants, male and female, sleep on the sixth floor under the second slope of the mansarde; and the depôts of wine, wood, or coal are together in the cellars beneath the ground storey, below which there are no living rooms. Though in Paris the servants

* It was hardly worth while to reproduce these plans here; the reader is referred to M. César Daly's illustrations of "L'Architecture Privée au XIX^{e} siècle," and to the "Revue" he conducts. They are to be found in the Institute Library.

are often abominably lodged in a roof, all classes of Parisian society evince repugnance to giving even a man-servant a living room, much less a sleeping room, below the level of the soil.

Household Routine.

In this country where the system of habitation is completely different, the plan of such a building will not be properly understood, even by architects, without previous knowledge of the habits of a Parisian family and the routine of Parisian life. Permit me, therefore, to describe an imaginary household inhabiting the first or the second floor. It is composed, say, of a gentleman and his wife, a daughter in her teens, a couple of children, a nurse or a lady's maid, a female cook, and a butler Perhaps there is also a son who is at school or college; and, let me add, with all deference to English conviction, there are not only homes in Paris, but many resound with the cry of more than two children. Husband and wife occupy the two bedrooms in the main building; their dressing rooms, and often a water-closet, adjoin, and the gentleman's bedroom is sometimes provided with bookcases and a writing table. The young lady has one of the two bedrooms behind, the two children the other; the nurse or lady's maid sleeps in a room, perhaps, on the opposite side of the kitchen. The two rooms in the roof are occupied respectively by the cook and the butler. A second water-closet is at the back of each residence; for the servants' generally a water-closet is usually to be found both on the ground storey of the building and in the roof. Now for the routine of life. Paris, it should be remembered, is wide awake, even in the fashionable quarters, at six in the morning; and that through the greater part of the year. Some of the day's work, both of trade and professions, is done before nine A.M. Before seven o'clock the porter has opened the great doors of the carriage entrance and admitted fresh air into the courtyard which undoubtedly requires it. There, a groom is rubbing down a horse, a coachman cleaning a carriage. In the different kitchens, tea or coffee is being prepared; this will be served before eight o'clock in the various bedrooms. Meanwhile the dust which is swept from the sitting rooms, the hall, the kitchen and the passages, is collected, carried down the servants' stairs, and deposited in the roadway. For this deposit the municipality returns interest: in fine weather or foul, in summer or winter, the streets and boulevards of the Capital have been swept and the dust-carts have disappeared before a few minutes after nine, every, even Sunday, morning. To provide the two daily meals, the mistress attended by the cook, or the cook alone, goes to market; hardly more than just sufficient for the day is brought home, and, usually, the purchase is a ready-money one. Part of the secret of French thrift is concealed in that practice and in the small space given to the kitchen, repulsive as the latter must be to an English housewife whose own beef and mutton emerge from a complete set of apartments presided over by a complete set of domestics. Breakfast is taken between half-past 11 and half-past 12, dinner about half-past 6, in the dining room; nor is that room ever used by true Parisians for any other purpose than eating and drinking. It is never occupied as a family living room; sometimes, when the housework is done, a maid servant sews in it, or her mistress may receive a tradesman in it, but that is all. Visits, except of a familiar character, are not paid until after midday; as with us, visitors are received in the drawing room. After dinner, the refuse of the kitchen, and all that household matter which is called dirt, are deposited in the roadway, as before—except that, in the evening, the legal hour for making such deposits is after 8 o'clock.

Thus I hope to make it clear that, though a great deal of traffic takes place upon the servants' stairs, very little time is spent by the members of the different families upon the principal stairs. Intimacy between superposed neighbours not only does not ripen, it does not grow; for though on meeting it used to be the custom to bow, they rarely meet. Any communication between them is usually made through the porter, who is the necessary and, if properly treated, the useful caretaker of such

houses. His salary is paid by the owner, that is, the freeholder of the property including both houses and land. All letters are delivered to the porter who distributes them; of him the visitor enquires before making perhaps an unnecessary climb. It is he who sweeps the courtyard, the carriage entrance, the staircases; who cleans the staircase windows and lights the lamps; who at night opens the great doors to carriages and the small door to pedestrians. He is the janitor, who, night and day, morally chained to the doorpost, is responsible for the security of the whole building; and in whose charge a tenant leaves his house during a family migration to the seaside or a country seat. Fifty years ago the porters of such houses pursued some sedentary occupation, but now, away from the strictly business neighbourhoods, it is rare to find a porter carrying on any petty trade. He has enough to do, if he does his duty, in keeping the building clean, while his wife maintains guard in the lodge.

Recent Improvements.

The many improvements of the last few years have tended to increase the comfort rather than the elegance of a Parisian home. In the new houses water is laid on even to the topmost house; a heating apparatus, provided and maintained by the landlord, is lighted during winter in the basement. Warm air introduced through flues in the walls is thus carried into the hall* of every house. This apparatus, the chief use of which is to warm the principal staircase, also communicates with a hot-closet arranged in the serving-room attached to the dining-room of each house. Housemaids' closets with the usual accessories have been lately introduced, though I should add that the work of cleaning floors, steps, and passages, done in this country by housemaids, is entrusted in France to men. Lifts for carrying coals, wood, and wine are here and there visible; the means for facilitating service here and there conspicuous. Hydraulic elevators are to be seen next the staircases of many new blocks of buildings.† But in houses, the rents of which average from £500 to £200 per annum, I could not find, even as late as last month, any intention or desire to increase the proportion of space allotted to kitchen accommodation. Though I saw every possible improvement introduced into the cooking range—though there were large cupboards, though there was abundant space for preparing and cooking meats of every kind—plenty of water and plenty of light—yet one room sufficed to contain what in London is divided into kitchen, scullery, servants' hall, housekeeper's room and butler's pantry! I left that room, though, with a regretful conviction that the soups and stews which may be concocted therein will be infinitely more palatable than any that usually issue from the wilderness under and above the ordinary clubs, taverns, and houses of London.

This kind of residence, reduced to a set of three rooms or developed to one of fifteen rooms, is, broadly speaking, the Parisian system of habitation—a system traditional to the great Italian cities, and adopted in the centre of Vienna and St. Petersburgh, of Berlin, Hamburgh and Brussels, and of

* The aperture by which the warm air enters can be opened and closed at will. The warm air flues are not directed into the living rooms. To properly warm in winter the staircase of a house-in-flats is one of the greatest boons—as regards comfort and economy—that can be offered to the tenants.

† It may perhaps be interesting to know that the elevator or *ascenseur*, now common in Paris, is partly due to a Paper read in our Rooms on the 18th January, 1864; and I have authority for the statement. Towards the autumn of 1866, the manufacturer of the Paris elevators happened to call at my office on business; he mentioned his desire to introduce passenger lifts into ordinary houses, and the conversation naturally reverted to the hydraulic lifts then working in London. To save time, I lent him my copy of the Transactions (1863-64), which contains a drawing of the English lift by Mr. Whichcord and an explanation of it by Mr. Easton. Some six months after, two elevators were at work on the Champ de Mars, at the Exhibition of 1867; and since then they have been freely used in different parts of Paris. In palliation of my own share in the piracy, I beg leave to say that when, at the close of 1868, I placed a hydraulic elevator in a château not far from Paris, it was Mr. Easton who made and fixed it, not his imitator.

Geneva. But of the kind of houses erected in those cities I only know by hearsay. Many new houses that I have seen in French provincial towns, and even in Cairo, are built on the Parisian system. It will hardly increase what latent admiration may be felt for it by people unfamiliar with French private life, to know that in Paris some of these sets of apartments let for a thousand pounds per annum exclusive of taxes. Others may be found as low as £40 a-year. The strangest fact remains—strange at least to a Londoner who knows how long it takes to get a new Metropolitan street inhabited or even built: the old and cheaper houses lose their tenants, and the new houses are eagerly sought and taken. I attribute it to the elegance and refinement, apart from any question of style or fashion, with which our French colleagues have endowed the ordinary houses of new Paris. To the character of the construction, the richness and excellence of the materials, to the security afforded by practically a fire-resisting house—in great part a legacy of the Second Empire—is due the extraordinary success of private building operations in the French capital. While, however, the speculator overpowers as much with the magnitude as with the beauty of his work, noblemen and gentlemen are still building hôtels for themselves—and intended for the exclusive use of one family—outside the main lines of traffic and business. Like the great mansions of the last century there is little in them of outward show, at least towards the street, for between that and the courtyard is often a high stone wall pierced with an archway closed by polished oak doors. Yet I take it that some of them only recently erected surpass for size and beauty the majority of patrician homes in London as much as the earlier hôtels of the Faubourg St. Antoine surpassed the palaces of the Strand and Westminster in Evelyn's or even Lister's days.

THE ADVANTAGES OF LONDON.

The English metropolis has an advantage which neither friend nor enemy fails to envy or remark. The capital of a country guarded by the sea, no fortifications have impeded its spread. Railways in its very centre connect high road with high road and street with street. They bind compact suburbs to the heart of town, and every morning disgorge trainfuls of travellers who regard town as simply a place of toil. Within a radius of Bow steeple, but beyond the sound of Bow bells, a certain part of the huge capital is devoted almost entirely to the higher branches of commerce. During this century the number of residents has not only decreased but the few who have lately resided there become year by year distinctly fewer. In the City the demand for office room extends to the uppermost storeys of new and old buildings. Far away through the Strand, Holborn, Regent Street, Piccadilly, and Pall Mall—over in fact all the nondescript mass of Central London—the traveller reaches great residential squares, long lines of residential streets in which an army of serried houses shelter innumerable families of rank, wealth, and position. Each of these houses, four, five, and even six storeys high, is inhabited, with rare exceptions, by one and the same family. Past the parks, along the northern and western roads, across the bridges into Surrey and Kent, back through the City into Essex, new towns have swallowed up villages and hamlets; have met at their confines; and in square, terrace or crescent, in park or road, running over four counties, interminable lines of thoroughfare are bordered with equally interminable lines of houses. The majority of these houses are each inhabited by one and the same family. To reflect seriously over the space they cover, and the income that each house represents, is to invoke a reality of individual ease and collective wealth surpassing, in a better fashion, the magnificence of Ancient Rome, and even the wildest flight of archæological surmise. A system which gives to each family not only

the superficial area of a plot of land but also the whole cube of space above it, reaching, were it possible, to the nearest heaven must be a right system. Anyone of either country, conversant with habitual phases of life in Paris and London, will freely admit the advantages of a system that grants to the head of a household the partly poetical license of breathing his native air on his own ground.

CENTRAL LONDON.

But at present I have faintly described only the City of London, the Suburbs of London, and Residential London. I passed over the Heart of London, alluding to it as a nondescript mass. It is indeed nondescript; for it is neither purely commercial nor purely official, neither residential nor specially monopolised by trade or manufactures. Yet in this Heart are contained the offices of the legislature and of justice, the clubs, the theatres, the parks; and through it runs what is more than ever the "Royal River of Thames."

To describe the houses of Central London I shall have to repeat much that I have said in other places and much that has been said about them by other people. First, let me call attention to the map hanging on the wall. It was prepared for a lecture delivered on a kindred subject at the Society of Arts.* In the map an attempt is made to distinguish by two opposing tints the isolated parts which are purely residential, and the great mass of houses the occupation of which is nondescript. The former are shewn by a rose tint; the greater part of the grey surfaces are lodging houses, or more correctly houses tenanted by more than one family or group of individuals. Within a certain radius of Temple Bar, even within a certain radius of Regent Circus, the great mass of the residents are lodgers. The neighbourhood of the Strand is almost entirely rented by tenants and sub-tenants, who occupy a storey, a set of rooms, or a single room. It was not always so; on the Bedford Estate, for instance, the houses and shops were not only built each for the use of a single family, but until recently they were all occupied as household residences.

The Shop and House.

Of the causes which lead to the disintegration of a residential neighbourhood, of shops and houses in the centre of London, two are paramount: one the desire to escape before and after business hours from the surroundings of business; the other the fact that the rent of floors and single rooms let separately, will often return to the owner enough annually to pay for a shop or an office in the centre and a private house or a villa at the circumference of town. The consequence is inevitable. The shop often remains in its previous integrity in the use of the owner; of the house he owns, the shop-door is the only entrance over which he can claim undivided control. His old private house-door is now a public entrance; the slender stairs which before communicated between the shop and the first floor rooms, between the two or three storeys over the shop, is now the common ascent and descent of the different groups of sub-tenants who inhabit them. That is what happens to an old house if its lease be renewed, or if there be still some years to run. Observe

* This map is published in the Journal of the Society of Arts; it is also to be found in the *Builder*, vol. XXXIV., page 305. It illustrated a Paper jointly prepared by Mr. T. Roger Smith and myself; and perhaps the diagrams, which accompany this, may prove that Mr. Smith's opening words were not mere rhetoric: "If," said he, "it be tacitly admitted by most Englishmen that whoever can make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, does more essential service to his country than the whole race of politicians put together, perhaps he who can make two healthy houses to stand in this colossal city where a single unhealthy one stood before, confers a greater benefit upon his fellow citizens than all the enterprising persons daily engaged in enlarging the area of inhabited London."

what happens when it is a question of re-building. Say, for example, some worthy tradesman is carrying on business in an old house which, ninety-eight years ago, was built by his great-grandfather. He is not only the owner of the house but also the lessee of the land on which it stands. His lease according to the ordering of such things is about to expire, that is to say, he is on the verge of losing altogether not only the land but all the buildings that during and since his great-grandfather's time have been erected upon it, and yet his business is of such a nature that he dare not leave the land. He therefore takes a further lease of the site, he pulls down the old house his great-grandfather built and to which he perhaps has made additions; he builds another in its place. Very likely the slice of land has a frontage to the street of 18 feet, and he cannot extend that frontage, his neighbours on either side having their own leasehold obligations to sustain; yet his ground landlord requires him to build. The unfortunate tradesman devotes the two lowest storeys of his new building to business purposes; as he lives in the country, the superstructure raised over his shop is of no use to him, yet that superstructure contains in cubical measure as much space and solid material as are to be found in a suburban villa or a small private house. Its three or four storeys consist of two rooms over two rooms reached by a narrow and steep stair.* The horizontal and hollow divisions between the storeys are of deal and mortar; an inch of wood and an inch of plaster form the only solid barrier between one storey and another. This same superstructure is offered indiscriminately to professional men as offices, to bachelors and even married people as residences, and the different floors of which it is composed return perhaps three per cent. interest for the outlay involved in their erection and maintenance. To rebuild under such circumstances is hopelessly unprofitable. Business men will not climb above a second floor, nor will even a confirmed club-man accept a "home" in which neither a chop can be cooked nor a servant lodged, in which the storage of a ton of coals is an impossibility —where by night the staircase is pitch dark, and by day the house-door is totally unguarded.

The Lodging-house.

Take a typical lodging house in the heart of London. It was originally a private house; it is composed of two kitchens below the street level, two parlours on the ground storey, two drawing-rooms on the first floor, two or three bed-rooms over, and two "attics." The lodging-house keeper and his wife pass the day in the front kitchen and the night in the back parlour. One group of lodgers occupies the front parlour, the second floor front room, and the back "attic." Another group takes the two drawing-rooms, the second floor back room and the back kitchen. A bachelor perhaps occupies the remaining "attic." If there be a third storey, another group inhabits it. In such a lodging-house the different groups are all day and hourly encountering each other; and the children perforce mix. The lodgings are not let by floors or even by sets of rooms; they are dove-tailed into each other. All who have had practical experience of such interiors cannot hesitate to admit, that in the majority of them, the worst features of life in common as it was practised centuries ago have been preserved; the best have been irrevocably forgotten.

* Captain Shaw, in one of his excellent and instructive books, says :—"If, as commonly happens in this country, every room opens on to some part of the staircase, it is obvious that a very small quantity of materials on fire in the lower part of the house may have the effect of cutting off all possibility of escape by the stairs; whereas if rooms are built in suites of three or four together, with only one door opening on the staircase, persons may retreat from one to another, defending themselves as they go by piling up bedding, wet blankets, or other materials calculated to arrest the progress of the flames and smoke; and thus obtaining additional time for help to reach them from without. In all countries where this mode of construction is adopted there is a corresponding immunity from heavy loss of life."—*Five Surveys; or a Summary of the Principles to be observed in Estimating the Risk of Buildings.* Page 35. (London, 1876: Effingham Wilson.)

An Island of Buildings in Regent Street.

Take an island of shops and houses in the heart of town; and I have chosen one in the very midst of fashionable trade. Bounded on the principal side by Regent Street, it has Warwick Street on the east, Beak Street on the north, and Regent Place on the south. The larger portion of the island is the property of the Crown; transferred at the commencement of every reign to the Commissioners of Woods, who are the official trustees appointed to pay over the revenue of Crown-lands to the Consolidated Fund in exchange for the Queen's Civil List, the greater part of the island may be called national property. Originally there were twenty-eight shops and houses upon it, there are now only twenty; and this apparent radical change has been effected without much visible alteration in the exteriors. The two houses in the centre fronting Regent Street have been amalgamated; in course of time those two houses have absorbed another house at the back of them, and possessing a frontage in Warwick Street; then two more houses south of the latter, in the same street, have also been absorbed. Thus five houses have become one house. At the corner of Beak Street and Regent Street three houses have become one. Again, No. 138, Regent Street has run through to No. 32, Warwick Street, and the two houses are now one. In Regent Place two houses forming together about 30 feet frontage, have become one house. Yet the character of the construction has not changed. The main divisions between the twenty-eight houses still exist; only holes, large and small, have been made in the party-walls. This desire or rather necessity for lateral extension—for extension, that is to say, of space at the same level—is experienced all over Central London; and one process of filling up the internal breathing area of an island of buildings very much resembles another. In this instance, twenty-eight houses were built close together, so that the principal front of each formed the continuous elevation of four streets. The twenty-eight houses each possessed a back yard or garden, and though it was only possible for draughts of fresh air to enter the internal area at intervals, still, after a fashion, it was breathing space. Bit by bit this breathing space has been filled up; half-a-dozen well-holes remain to convey light and air to the lower storeys; and including the basement, each of the twenty-eight (now twenty) houses is five storeys high—the top storey in most cases being contained in the roof. I propose to show how this island, unhealthy and uncomfortable, might under the Parisian system of plan be healthy and comfortable; how a few of the shops might have the means of extension at the same level larger than the largest shop now on the island; how all the shops might be distinct from the residences erected over them; how instead of sham party walls pierced and mutilated, there need be only two solid vertical divisions; how from the necessary connection of the internal courtyards with the external streets the gradual filling up of those courtyards with even low buildings would be impossible; how, in fine, forty shops and houses of different sizes might be made to occupy less space of ground than the twenty shops and houses of different sizes which now crowd the island—and without increasing the average height of the front walls. But lest my motives should be misunderstood, I beg leave to say that as the greater part of the island—being crown or national property—is above the Law, so for more years than I can live must it remain beyond all possibility or hope of improvement in the direction to which the makeshift alterations of the actual tenants unmistakeably point. Before, however, entering upon this division of my subject, I beg leave to describe the construction, and some of the rules and restrictions affecting that construction, of modern houses in Paris.

THE CONSTRUCTION OF A *MAISON-A-LOYER.*

Laws and Restrictions.

Many fallacies are rife amongst Englishmen concerning Parisian dwellings, and people still frequently talk about the "ten-storeyed" houses of Paris, the fact being that several streets of houses in the City of London are infinitely more lofty than any in Paris. None of more than five storeys above the ground-floor, and a roof, have been built in the latter city since the year 1784. It was then first enacted that, for streets of 30 feet (French measure) and upwards, the height of a façade must not exceed 54 feet; for streets of from 24 feet to 29 feet, a façade must not exceed 45 feet in height; and for streets under 23 feet wide, a façade must not be higher than 36 feet. This height was to be calculated from the level of the road to the top of the cornice: and in houses of small depth the roof was not to be higher than 10 feet, in those of extra depth 15 feet. Yet it has been said that the mansarde was invented to evade these laws! But the curb roof to which the name of the great Mansard is given, the tall roofs such as are to be seen at the Château de Maisons—erected by him (1642-51)—had been in fashion for certainly 150 years before the first laws regulating the height of Paris houses were promulgated. From 1789 to 1791 other decrees were issued, and in 1844 the Count de Rambuteau laid down certain proportions for "the height of façades bordering the public ways," which were little, if at all, modified by the Imperial decree of the 28th of July, 1859. The legal height of a Paris house depends upon the width of a street in which it is to be built. This height is measured from the pavement to the top of the entablature, including therein all constructions in stone, in fact everything vertical with the front wall of the house, and this height is as follows:—11 m. 70 c. for streets less than 7 m. 80 c. in width, 14 m. 60 c. for streets of 7 m. 80 c., and above that width up to 9 m. 75 c.; 17 m. 55 c. for streets of 9 m. 75 c. and above that width.*

Only in streets or boulevards of 20 mètres or more wide can house-fronts be carried to the maximum height of 20 mètres. A building situated at the corner of two streets of different widths may sometimes be carried on the side of the narrower, to the height permissible for the wider street. But whether house-fronts are placed on the line or are set back from it, or are erected sloping or according to any other manner, if they face the street their height is determined by the width of the street in which they are built. Buildings hidden from the street in courtyards and quadrangles must not exceed, as far as their fronts are concerned, the height of 17 m. 55 c., measured from the level of the courtyard in which they are placed. And lastly, though on the boulevards and streets which are 20 mètres wide the façades may be 20 mètres high, only five storeys, including the entresol and exclusive of the roof, can be constructed over the ground floor.

The laws relating to roofs in Paris are as logical as they are precise, and all the ingenuity of the Mansards, both uncle and nephew, could not have evaded them. In streets less than 15 mètres wide, the roof must not exceed a height equal to half the depth of the building, including the projection of the top cornice; and the profile of the roof on the portion facing the street must not overstep a line inclined at an angle of 45°, starting from the extreme projection of the top cornice to the ridge. But in the case of a block, which is upon a boulevard of 20 mètres wide, the straight line of 45° may be altered to a quarter of a circle; the radius of that circle must be equal to half the width of the building, exclusive of the projecting top cornice, which

* These were the rules in force until the fall of the Second Empire. Modifications, if any, that have been made in them are unimportant, if I may judge from a recent examination of the houses and shops bordering the new Avenue de l'Opéra, and other thoroughfares in Paris.

must be left outside the quarter of the circle. The chimney-shafts must not break the sloping line of the roof, except at a distance of about 5 feet (English measure) measured horizontally from the external face of the front wall, nor must they rise more than 2 feet above the ridge. The external face of the dormer windows fronting the boulevard must be set back at least 1 foot from the face of the front wall; and their width must not exceed 5 feet from out to out.

The façade of houses erected upon the boulevards and principal streets of Paris, must perforce be composed of freestone, and the face towards the street of the chimney-stacks, as well as of the party-walls, which, as in London, are carried up above the roof, must be of the same material. Although I am not sure if the law compel proprietors to build the floors of their houses with iron joists, filled in with plaster concrete, this is the invariable practice; the general application of iron to the construction of floors in Paris is due to the carpenters, who in 1840 "struck" in a body, and with such effect that it was then impossible to obtain a carpenter either for love or money. Iron floors of a very complicated character had been used for a few public buildings, and the necessity to do without carpenters compelled the architects to extemporise floors with bands of iron placed on edge, and strengthened with transverse iron bars. The French custom of filling in wooden partitions and the spaces between the roof rafters with broken lumps of old plaster walls run in fresh plaster, led to attempting the same process with the iron framework before mentioned. Ultimately the rolled T and double I joists were introduced by a few energetic manufacturers, and the problem of iron floors was solved, at least as far as Paris is concerned. These floors, unlike similar work in England, are no man's speciality or patent. The rolled iron joists, once bought, can be laid by any smith, carpenter, or *maçon*, and finished in plaster by any one of the last-named trade. An order from the architect is alone necessary, and it may perhaps be useful to explain why an architect is absolutely indispensable to people about to build in Paris.

Trade and Professional Practice.

In France there are no general contractors as in England—none able or willing to contract for a whole house, much less a row of houses. The architect alone knows how to summon around him the several tradesmen who, in their different capacities, assist him in erecting the building he designs—if not always under his immediate direction, under that of a trusted assistant or favoured pupil. On an ordinary *maison-à-loyer* there is rarely a clerk of the works. The foreman of the *maçons*, in conformity with tradition, is the head of all the workmen of all trades. He is the *maître-compagnon;* and in France the *maçon* is not a worker in freestone like the English mason. He is bricklayer, plasterer, builder of rough stone walls, worker in cement of all kinds. The *maître-maçon*, that is to say, the contractor, is entrusted, not only with the foregoing works, but also with the masonry, as the term is understood in England. He employs the *tailleur-de-pierre* to work the freestone, and the *ravaleur* to finish it when it is fixed in its place. All such and similar work is paid for by measurement after completion, according to a municipal tariff, which varies annually, and which forms a basis of prices for artificers' work done within the city of Paris. Contractors sometimes tender against each other and agree to work at so much per cent., as the case may be, below the municipal prices; some private works are executed at those prices. The Parisian architect has to treat with, say, a dozen tradesmen often unknown to each other, innocent of any sort of mutual organisation or connecting link, and unwilling to accept instructions from any one but the architect their master—the master-of-the-work. A dozen different contractors imply a dozen sets of drawings, a dozen stamped agreements, a dozen bills. These bills are prepared by surveyors (*métreurs*), who are specially employed by, or are in the employ of, the tradesmen in question. The architect has to verify the

items of each bill, to check the dimensions, and reduce or modify the prices for labour and materials in accordance with the signed agreements and the Parisian tariff. He consequently employs a specialist (*vérificateur*), whom he pays out of his usual commission, sometimes eight francs in the thousand upon the total of the contractor's bills, sometimes as much as 1 per cent. The architect alone is responsible for the accurate verification of the bills, the name of the surveyor who assists him not appearing in the transaction: his responsibility to his client, and to the State, endures for ten years after the completion of the work with which he has been entrusted. Some of the tradesmen's bills are accompanied with drawings, often of an elaborate character, of the particular works executed by them; this occurs even when the architect's design has been carried out with few, if any, alterations in the course of its execution, and when his drawings have been very carefully prepared.

The Foundations.

I propose to describe the construction of a first-class *maison-à-loyer*, erected in Paris, with the best modern appliances which have come under my notice, or have been practically tested by myself. The block in question is, however, a mere fancy picture,* sketched at different times and from several examples of building construction in France.

The site is cleared, and the "master-companion" marks out the trenches to receive the foundations of the new basement-walls; but below these, are two large cubes of earth to be excavated for the construction of two cesspools required to drain two separate sets of water-closets, one set for the large residences, and one for the servants and a few small residences, of which the block, say, is composed. A cesspool in Paris must be almost immediately under the water-closet it serves. The drain-pipe must descend vertically into it, and continue vertically to a certain height above the ridge of the roof. A junction-pipe connected with the water-closet apparatus enters this main a little below the level of each floor, and in juxta-position to this main is placed another pipe, which ascends vertically from the cesspool to above the ridge of the roof, the latter being used exclusively for ventilation. Both these pipes are attached to a strong wall, often the party-wall, with hoop-iron, and completely enveloped in cement. The walls, bottoms, and vaults of these cesspools must, according to law, be built of *meulière*, a reddish petrifaction, full of cavities, and very hard. It is found near Paris, and is little if at all known in England; it affords an excellent surface to receive the coat of cement with which the walls internally of all cesspools must be covered, their internal angles being rounded. From the vault of each cesspool a communication must be formed with the courtyard, or at least some open area, and the top of this shaft must be covered with a stone slab, fitted into a stone frame. The slab is hermetically sealed, and only opened when the cesspool is full; the stone cannot be refixed, after the cesspool is emptied, until the interior has been officially inspected. The cesspools are so built that the top of their vaults is on a level with the floor of the cellars or the basement storey, which is perhaps extravagant. Sometimes the cesspools are constructed in the basement storey itself alongside and not under the wine and coal cellars of the several tenants. While they have been building a gang of men have been occupied at another corner of the site. They are preparing *béton*, which, I venture to say, is less easily adulterated than the English concrete. In the corner alluded to, a platform has been made of planks, on one side of which is a heap of pebbles and chips from the stone-cutters' yard, on the other a heap of sand; under a shed close by, a large number of sacks containing hydraulic lime. Some mortar is already prepared for use. Wheelbarrows are scattered about, and the bottoms of some are made with

* A great deal of this description has appeared in the Architectural Journals; it formed part of a Paper read to the Members of the Junior Society in December, 1875.

iron bars to hold the pebbles—for it is necessary that these be thoroughly washed—and consequently when placed in the wheelbarrows the water escapes from them through the iron bars. My *béton* shall be, perhaps, extravagantly good; and, as it is well known, *béton* is a mixture of hydraulic mortar with pebbles or stone chips which must be hard, rough, about the size of an egg, and similar to those used to macadamise a road. The mortar and pebbles are sometimes very well mixed by a machine, but it is better done by hand; and for this purpose five wheelbarrows are required,—three with bottoms of iron bars, and two of ordinary make. The three first are filled with clean pebbles or chips, and the other two with hydraulic mortar. One barrow full of pebbles is wheeled to the wooden platform, and its contents are spread out over the entire surface; above these is uniformly spread a barrow of mortar. Then a second barrow of stones is deposited in the same manner, and a second barrow of mortar, which is then covered with a third barrow of stones. The heap is turned over with spades, and the substance is dragged backwards and forwards with a three-pronged fork or hook by the workmen. The pudding thus made is considered to be sufficiently stirred when the pebbles are entirely enveloped in mortar. Before throwing the *béton* into the trenches a layer of gravelly sand has been spread over their bottom surface, which will prevent the mortar from becoming deteriorated with the soil beneath before it is properly set. There is no absolute necessity to ram *béton*, if only it be carefully laid. It is spread in horizontal beds of from 8 in. to 10 in. thick, and the walls upon it can be almost immediately begun. No *béton* has been put under the cesspools, not because the soil upon which they are built is exceptionally firm, but because the principal walls of the building are not carried upon those of the cesspools. Under the principal walls there is a height of 2 ft. 6 in. of *béton*, and when they have reached a few feet in elevation, there will be spread over the whole area of the building about 10 in. thickness of *béton*, the top surface of which will be level with the top of the *béton* under the walls. Thus can be supported the 9 in. brick partitions required to form the numerous coal and wine cellars which occupy the whole of the basement, for in Paris an underground storey is seldom if ever inhabited. Double retaining-walls to protect a basement from damp, which are common in England, are seldom used; the walls which touch against the earth are built of rough hard stone, 2 feet at least thick, coated externally with cement. These walls are now, say, within a few inches of the street level; brick arches are turned over the cellars between the partition walls, their flanks are filled up with more *béton*, and a general even surface is obtained about a few inches below the finished level of the ground storey. A horrible odour pervades the works. Around the cauldron with a blazing fire under it, two men are dancing. One stops to throw in a lump of bitumen, then a little gritty sand, and the other stirs up the contents. Suddenly one rushes off with a saucepan full of the boiling liquid and spreads it cautiously over a part of one of the walls; then a bricklayer lays brick, hurriedly on the same spot, blasphemes and sucks his fingers; more asphalte is brought, always in a boiling state, and eventually two courses of hard bricks are laid over the principal walls.* Ultimately a coat of asphalte about $\frac{1}{8}$ inch thick will be spread over the whole area of the ground-floor, under stone, tiling, or parquetry, as the case may be.

At the Street Level.

The existence of a shop on the ground-floor necessitates as much open space as possible. The weight of the internal walls must be concentrated upon a succession of supporting points or piers,

* I am bound to add that this is not the usual practice: a damp-course in Paris is generally made with bitumen only. My description refers to damp-courses built with acknowledged success at the Château de Bizy near Vernon, and the Château de Martinvast near Cherbourg.

to be built in solid blocks of hard lime-stone. The difficulty of making a house-front appear logically constructive when a shop-window forms its ground storey is lessened in Paris by the fact that there every *maison-à-loyer* has an entrance for the inhabitants of the residences over. This entrance (*porte-cochère*) is necessarily of stone, and wide enough for carriages; the lateral walls of it are of stone. Iron columns are sometimes placed between the stone piers of the ground-floor front. The columns are generally coupled in the thickness of the wall; so are the girders they support, which are of rolled iron about 10 inches deep, secured together with wrought iron collars about 4 feet apart. When finished, they form solid lintels. Planks having been temporarily placed under them, they are filled with bits of broken brick, pottery, lumps of old partitions, &c., and the whole "run" in fresh plaster.

The lintel of iron and plaster concrete thus formed is about 18 inches thick, 12 inches deep, and say from 6 feet to 8 feet long. Sometimes in very superior work such lintels are filled with new bricks carefully laid in cement; but where there is no risk of damp, plaster is as good, and certainly cheaper. Similar lintels are placed over all the internal piers, and upon them the ends of the rolled iron joists forming the floor of the entresol storey are laid. These lintels also receive the weight of the partitions of the different storeys over. The joists can be obtained of all scantlings up to 12 inches in depth, with flanges of proportionate thickness and width. They are slightly curved, so that when enveloped in plaster and weighted they become almost straight. The completed flooring, including the plaster ceiling and the parquetry, certainly does not exceed 12 inches in thickness. The rolled joists, about 6 inches deep, are placed 30 inches apart; and at right angles to them are fixed wrought-iron bars of from $\frac{5}{8}$ in. to $\frac{1}{2}$ in. square, which are bent at the ends so as to clip the upper flange of the joist, and permit the bottom of the bar to be level with the lower flange of the joist. These bars are placed about 3 feet apart, and as much as possible in a straight line; for, in this manner, they act as a strut. A blow with the hammer suffices to fix them, and this done the joists are necessarily stiffened. Upon these bars, in lines parallel with the joists and of the same length, light iron rods are laid. All this iron has received two coats of paint,—of iron minium (*minium de fer*),—and the skeleton of the floor is now ready to be *hourdé plein en plâtre*. This is a simple proceeding: a temporary ceiling of planks is erected under the skeleton. Upon this planking are thrown bits of old plaster, brick, and hard rubbish of all kinds until the whole space between the joists is filled up to the level of their top flanges. Liquid plaster is then run into and over the whole mass of iron and ballast; the next morning it is possible to jump upon the floor and order the removal of the planking beneath it. But that useful substance plaster has a tendency to swell, and if a small cavity be not left between the solid plaster floor and the stone wall the latter will be pushed outwards. It is usual to tie in the external and party walls with iron bands looped at different points over circular iron rods (*ancres*) inserted vertically in the centre of a solid block of stone, and secured in plaster. These bands are hooked together midway between the rods; the chains laid on a level with each floor are said to serve in stone construction the purpose of hoop-iron bond in brickwork. But in spite of the precaution usually taken to paint them, the insertion of such chains into soft calcareous stone, and indeed the insertion of any iron into limestone, is a hazardous proceeding, more particularly when plaster is used. Damp swells the plaster, rusts the iron, which then increases in bulk and cracks the stone; or it is ultimately reduced to carbonate of iron.

The first House over the Shops: the Entresol.

The building is, say, at the level throughout of the first storey over the shops, and the walls have reached to within a few inches of the finished line of parquetry. The master-companion is engaged in

finding the centres of doors, windows, fire-places, &c., and these centres are all carefully marked upon the plans. He has fixed to the scaffolding outside the walls strips of deal, and tells off upon them the distances from centre to centre of the front window openings. If the walls are rectangular, he tells off the same distances upon similar strips of deal fixed to the scaffolding outside the walls of the courtyard. Lines of thin cord are then stretched from one point to another, and the principal centre lines drawn, as it were, full size upon the works. Where these lines cut the walls, he spreads upon the latter a layer of plaster, and then with the aid of the plumb-line, square, and a piece of black chalk (*pierre noire*), he marks upon the plaster the centres of all openings, which marks remain until the masonry is terminated; and they serve again to find the centre of the keystone in the arch over. The first course laid over the shop-window lintels is generally a projecting cornice of hard stone. The top of it forms the sills of the entresol windows, which are casements, and descend almost to the parquetry. Up to this height the stones have been lifted with slight difficulty, either rolled upon an inclined plane made of planks, or pulled up by the "*chèvre*," a species of "crab." But, in the meantime, four tall masts, some 70 ft. high, have been fixed just in front of the façade. These are connected at intervals with transverse planks, and further strengthened with cross-pieces, the whole forming, when finished, a skeleton shaft. Within it, the blocks of stone will be lifted to the height required by chains swung over a wheel fixed at the very top, the motive power being stationed at the bottom, and consisting of steam or water or manual labour, or the last new invention.

The Façade.

The front of a *maison-à-loyer* is composed of solid blocks of freestone, about 22 in. thick, laid in the same position horizontally as they were found in the quarry; one of the reasons for this is that the bed of the stone ought not to be exposed to the atmosphere. Nor ought the heart of the stone to be exposed. As is well known, the material used in building operations in Paris is a soft limestone found deposited by layers in the quarry, and it is extracted in large blocks. It is not worth while to saw those layers horizontally, even though it only requires the toothed saw to do it. The height of each course is the height of a layer of stone, and its power of resistance to the many deteriorating influences around it depends upon the free exercise of that natural action with which it is endowed. To use it as mere ashlar facing is positive destruction to it. In London the appearance of an ashlar face soon after completion is well known. The salts developed in the mortar behind it (of plaster, lime or cement) force their way to the surface, and though some Portland stone may be strong enough to resist the internal disintegration which the passage of salt causes, the soft limestones of France suffer actual injury in their component parts from such action. Soft calcareous stone easily soaks up water, but it also easily ejects it; and provided the action caused by moisture be free from the outside to the inside of the stone,—provided the stone be so placed as to permit the moisture it has received from the outside to be drawn away from it in a fluid state, its component parts will not suffer deterioration. But if (as in the case of ashlar when only one side is free) the exposed face of the stone dries and leaves the heart unnaturally wet, the internal moisture, having inevitably found a way out, will crystallise upon the surface which will become inflated and then scale off. Damp attacking a solid stone wall from the inside of the room which it encloses is drawn from it by natural means; but damp, penetrating internally a brick wall, faced with ashlar, destroys the latter, because the moisture cannot be drawn naturally through the stone, which on its external surface is dry.

The front wall is crowned with a deep and projecting cornice, the top of which is on a level with

the base of the mansarde; and this level is about 65 feet 10 inches (English measure) above the foot-pavement, which is the extreme height allowed by law for a house on a boulevard of 20 mètres wide and upwards. There are, however, still means to construct one more storey, and an apology for another. The one will compose a house, and the other a host of small bed-rooms to be apportioned among the various tenants for the accommodation of their servants, both male and female, as I have already explained. These storeys are both in the mansarde; but the lower one is so contrived that the external wall is perpendicular, and not sloping. The compulsory setting back of the dormer windows favours the construction of a broad continuous balcony over the top cornice, which causes the fifth floor of a Paris house to be much appreciated. There is also a continuous balcony supported upon corbels over the first floor, and smaller balconies of slight projection to the other windows of this house. The balconies are constructed of slabs of hard limestone from 8 inches to 10 inches thick, moulded on the face; their soffits are often panelled between the consoles on which they rest.

The Mansarde.

Many of the Paris houses are roofed with rolled iron principal and common rafters and with iron purlins all enveloped in plaster, forming sloping walls of great solidity. In that case battens to receive the slates and lead flashings are not used, for it has been satisfactorily proved in France that the best foundation for lead coverings is plaster. Strips of iron are screwed to the iron rafters, and the slates are suspended from them upon copper hooks. In very good work the lead flashings and lead "slates" are hooked—never nailed or fastened with cement—or they are dressed up freely under a projecting stone-fillet moulding. The French dormer windows are, of course, of all sizes and shapes, and almost of all materials. Some are of oak painted like lead, others of zinc, lead, and sometimes copper. Those which can be supported upon the front wall are generally of stone. In the time of Louis XIV. they were often made of oak and covered with lead; but it is now known that oak deprived of communication with the air destroys its lead covering. The same action does not take place, at least so rapidly, when the framework is of deal. For lead dormers, the crudest possible skeleton in iron is put together and painted. Upon this the skilled workman adjusts the different pieces of beaten lead ornament, moulding, or plain covering, as the case may be. He solders them together at the back and round the iron; and the dormers, finished at the workshop, have only to be packed and sent to the building of which they form no insignificant part.

The "Ravalement."

The roof is now covered, the party-walls and chimney-stacks are finished; but the *façades* fronting the boulevard and the court-yard have yet to be dressed, cut into mouldings, and carved, for at present the different architraves, cornices, pediments, and mouldings have been merely "blocked out" by the ordinary stone-cutters. Another set of workmen have now to shape them according to the full-size profiles which they receive from the architect. All the nearly horizontal surfaces of the stone exposed to the weather, excepting the balconies, are covered with zinc. Where there are no projecting balconies to the windows the sills are covered with zinc. A mahogany rail is fixed in the opening upon iron brackets, secured to each reveal, for all the windows of a Paris house are casements descending to within a foot or less of the parquetry.

As the carvers and sculptors finish, the scaffolding descends from storey to storey, until, arrived at the ground floor, the Parisian architect may pardonably congratulate himself upon having accomplished a piece of work fairly artistic when compared with similar work executed in another and a neighbouring capital. But he does nothing of the kind, for he knows that his troubles only

begin when the roof is covered, and the task of completing the interior begins. He has summoned the contractors to wait upon him at the usual hour—between seven and eight a.m.—when the detail drawings, copies of which are already in the hands of the joiner, the smith, and the smaller tradesmen, will be re-examined by both architect and contractors. On the same day there will be an appointment at the works, and the curious passer-by may possibly see, towards four in the afternoon, a small crowd of respectable men standing in a forest of scaffold-poles. These are the contractors. Suddenly they all take off their hats, for the architect has arrived, and has summoned the master-companion to attend him in the inspection he is about to make in company with the whole bevy of contractors. As he passes through the works, the men salute him; from the beginning to the end of a new building he is the recognised master-of-the-work, whose decision is final, and whose position is unassailable. And the politeness with which they treat him is increased when, as I know from personal experience, he sometimes happens to be a foreigner.

The Principal Staircase.

A comparatively new combination of iron and plaster forms perhaps the best kind of stair for a *maison-à-loyer*. An iron carriage of an L shape, the upper edge of which is cut into the requisite number of steps, is secured at the bottom to the brick vault or a wall, and, at the level of the first landing, to a joist much the same as in wood construction. Each riser is a piece of thick sheet-iron fixed at one end to the carriage with an angle-plate and bolted, and the other end is inserted in the wall. To form the soffit, iron bars must be placed below the risers; one end of them is secured to the flange of the carriage, and the other let into the wall. Upon these bars thin iron rods are laid, and this skeleton is filled with plaster concrete in the same way as the iron floors are treated. Not alone the soffit, but the section of the stairs, is thus formed, and upon the latter are fixed slabs, often of marble, with the moulded nosing of each returned over the iron carriage. The landings are formed with iron joists, bars, and rods, in the usual way, enveloped in plaster concrete. This horizontal plaster surface will afterwards receive perhaps a marble covering, the border of which will be in slabs of white marble, and the centre in small cubes of coloured mosaic work. The treads may be of oak, stone, or white marble. The standards of the iron railing are fixed to the external face of the carriage, and the soffits of the stairs and landings finished in plaster in the usual way. I would paint the metal portions, not to imitate marble, but with iron minium obtained from Belgium.

The staircase fixed, contractors and the architect can get easily to the fifth floor, which is to be let as a residence: so the living-rooms and the vestibule must be boarded with polished oak parquetry; only the kitchen, and the passage leading to it, will be tiled. The oak door-frames have now to be put in their places. In walls of one brick or more thick these frames are fixed with cramps, or rather staples, against the face of the wall; the reveal is made with plaster, and on the opposite side an oak architrave, about as thick as the plaster coat, is secured with iron staples. These staples (*pattes*) are screwed at one end to the wooden door-posts, and at the other are split into claws, which are inserted into the wall, and fixed with plaster. The junction of the wood and plaster is concealed by wood mouldings. In Paris, no wooden lintels are ever used. In a solid stone wall the arch over an opening is made through the whole thickness of the wall, and the rebate to receive the wood frame is cut after the building is covered. The frames are fixed in these rebates with iron staples and plaster. In a brick wall, which has only its own weight to support, the openings are covered with iron bars, upon which bricks are laid in the form of an arch, and the whole enveloped in plaster. The ceilings and cornices are much more artistically finished than people are accustomed to see in England; and, descending from floor to floor, the ornamentation of both increases in value. Mirrors with gilt frames are placed over all the fire-places, those of the bed-rooms included; they are considered

neither as fixtures nor furniture, but as part of the architecture. In superior residences the fire-places are built for the consumption of wood, as of old, but in the smaller houses cast-iron grates are now introduced for burning coal. The fittings of the shops are usually left to the taste of the tenants who are to occupy them, though the cost is defrayed by the landlord.

AN ISLAND OF LONDON SHOPS AND HOUSES AS IT MIGHT BE.

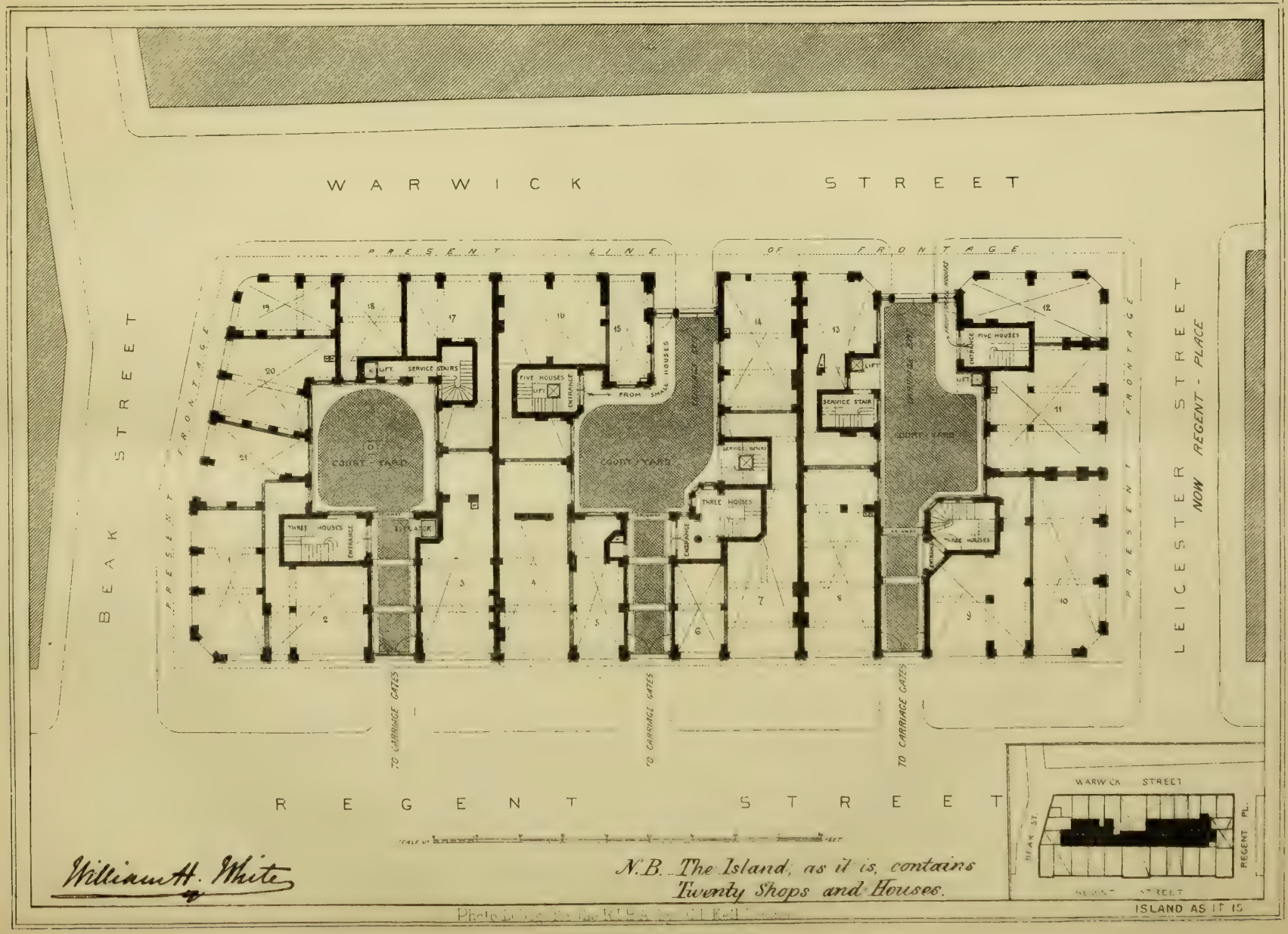
The Shops (see Diagram I).

It will be remembered perhaps that I referred to an actual island of buildings in Regent Street, and that I proposed to show the same island occupied with shops and houses such as may be seen in the streets and boulevards of Paris; or rather in a thoroughfare not more important to the French than Regent Street to the English capital. The plan of that island as it is, is shown in a corner of Diagram I. The twenty-eight houses which now compose it have, from the necessities of business rather than habitation, diminished to the number of twenty. In Diagrams I and II the island is arranged according to the Parisian system of distribution: the shops are in Diagram I, the houses in Diagram II. The island is divided into five blocks of shops and houses, separated by two party-walls. Take the two southern blocks, C and E, partly in Regent Place: they hold six shops of moderate size as I have chosen to divide them; they can with equal facility hold only two shops without destroying the points of support sustaining the superstructure. Take the northern block partly in Beak Street: I have divided it into eight ordinary shops; it can without difficulty become one and the same shop lighted all round both from the external streets and the internal courtyard. Take the central blocks: they are divided into seven shops; they are equally fitted for four or two shops each with a good frontage. Now take the frontage towards Regent Street of the houses as they are; there are twelve houses, and, say, ten have private entrances to the upper floors besides the shop doors. By allowing only 3 feet to each private entrance 30 feet of frontage are used. Instead of ten narrow passages of 3* feet each, I propose to give three carriage entrances—that is to say, archways of 10 feet each. Take the frontage to Warwick Street: the London system divides it into eleven parts, or rather eleven houses, and if each is to have a private as well as a shop entrance, nine at least of those houses must have doors in Warwick Street; the nine doors therefore engross 27 feet of frontage. I propose, instead, to give two carriage entrances open to the sky, of together about 30 feet. By the present system, if there are to be private doors leading to the upper storeys, 12 feet of the frontage towards Beak Street must be given up to them; and 9 feet of that towards Regent Place must be sacrificed for the same purpose. By the Parisian system the whole frontage of both Beak Street and Regent Place can be devoted to shop-windows and shop-doors. Hence the two systems, that of London and Paris, may be partly compared in the following manner:—

	ft.	in.
Width of frontage devoted to private entrances to the upper part of houses in an island of London houses according to the present system . . . . say	80*	0
Width of frontage devoted to private entrances to the upper part of the same island according to the suggested system . . . . . say	60	0
Total economy of shop frontage by the Parisian system . .	20	0

* No one can deny the modesty of this estimate. I might with perfect propriety allow a private entrance to each of the twenty-eight houses, for hardly any of the floors in the superstructure are at the same level, and most of the several houses that have been absorbed possess no means of communication between them on their upper storeys. The whole width of the frontage devoted to private entrances may be estimated at 84 feet.

Diagram 1.



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N.B. The Island, as it is, contains Twenty Shops and Houses.

A SKETCH-PLAN OF ISLAND, AS IT MIGHT BE,

Containing Forty Shops and Houses. (See Diag II)

Consequently, though about 30 feet run of frontage is lost by setting back the line of suggested buildings in each of the surrounding streets, the width of frontage to be devoted to shop space, and to points of support, is only 10 feet less than before the widening of the four streets. Thus—

	ft.	ft
Entire frontage of island as it is, say, ...	605	
Deduct for private entrances, say, ...	80	
		525
Entire frontage of island as it might be, set back from the present alignment in Warwick Street, Beak Street, Regent Place, and Regent Street .	575	
Deduct for private entrances	60	
		515

Instead however of twenty shops, which by reverting to the original subdivision can be made into twenty-eight, but not more, the plan drawn on Diagram I shows twenty-one ordinary shops. The latter, without the removal of even one support, can be turned into five extraordinary shops; or by the addition of a few brick partitions, removable at will, can be converted into twenty-eight and even thirty shops. Of the suggested twenty-one shops, seventeen possess three storeys: a basement, a ground floor level with the street pavement, and a mezzanine floor over. The four others have only two storeys: a basement and a ground floor. A glance at the plan suffices to show with what facility the basements can be lighted both from the internal courtyards and from the streets. In Diagram III the heights of the shops and the storeys composing them are given.

The Mezzanine over the Shops.

Of the twenty-one shops suggested in Diagram I, only seventeen have a storey over intended exclusively for the shopkeeper—not as a residence, but as an important part of the shop. Collectively the mezzanines of the seventeen shops contain thirty-three rooms, some of them 22 ft. by 17 ft. in size. The communication between the mezzanine, the shop and the basement, may be maintained by a small staircase specially provided for each shop. A sitting-room, a lavatory, even bed-rooms, can be arranged in the mezzanine; and all the twenty-one shops, with one trifling exception, possess window space behind sufficient to construct a counting-house or a sitting room on the ground floor. In fine, it will be seen in the three diagrams of plans and an elevation, that besides the usual two storeys—a ground floor and a basement—to the twenty-one shops, there are as follow:—

Eight shops with mezzanines, containing together	14	rooms.
Seven „ „ „	9	„
Six „ „ „	10	„
Total	33	rooms.

The Houses (see Diagrams II and III).

The practice, now habitual over the greater part of Central London, of letting the upper part of a building to families, groups of persons, or individuals having no connection with the shopkeeper on the ground storey, is exemplified in the island of actual shops and houses to which I have referred. Nearly all, if not all, the narrow fronted houses in Warwick Street, for instance, have an entrance to the upper storeys distinct from the shop entrances; and this arrangement holds good all round the island. It is of course difficult to say exactly how many rooms are to be found above the shops; but I will admit that above the two lower storeys—the ground floor and basement—the superstructure holds 182 rooms, an estimate which gives fourteen more than the ordinary two rooms to each storey

of each house; and some of these, be it remembered, are mere "attics." The largest of them, indeed, are of the kind usual to houses of 18 ft. frontage and 36 ft. depth, that being about the superficies of the majority. Nor are the rooms in sets; where a communication has been obtained through the party-walls four or perhaps five rooms have been connected, but out of the 182 at least 150 are mere single rooms forming no sort of habitation other than it is usual to extemporise in the heart of the metropolis. I offer instead:—

Three complete and distinct houses of				14 rooms each (A)	42 rooms.
Three	do.	do.	do.	10 rooms each (E)	30 do.
Three	do.	do.	do.	9 rooms each (B)	27 do.
Ten	do.	do.	do.	5 rooms each (C and D)	50 do.
				Nineteen houses containing together	149 rooms.

Thus, though it is a matter of secondary importance, I obtain 149 *plus* 33 rooms over my suggested shops to exactly counter-balance the 182 rooms over the shops in the island as it is; and I will now describe the five blocks of superposed houses in which I have divided the island as it might be.

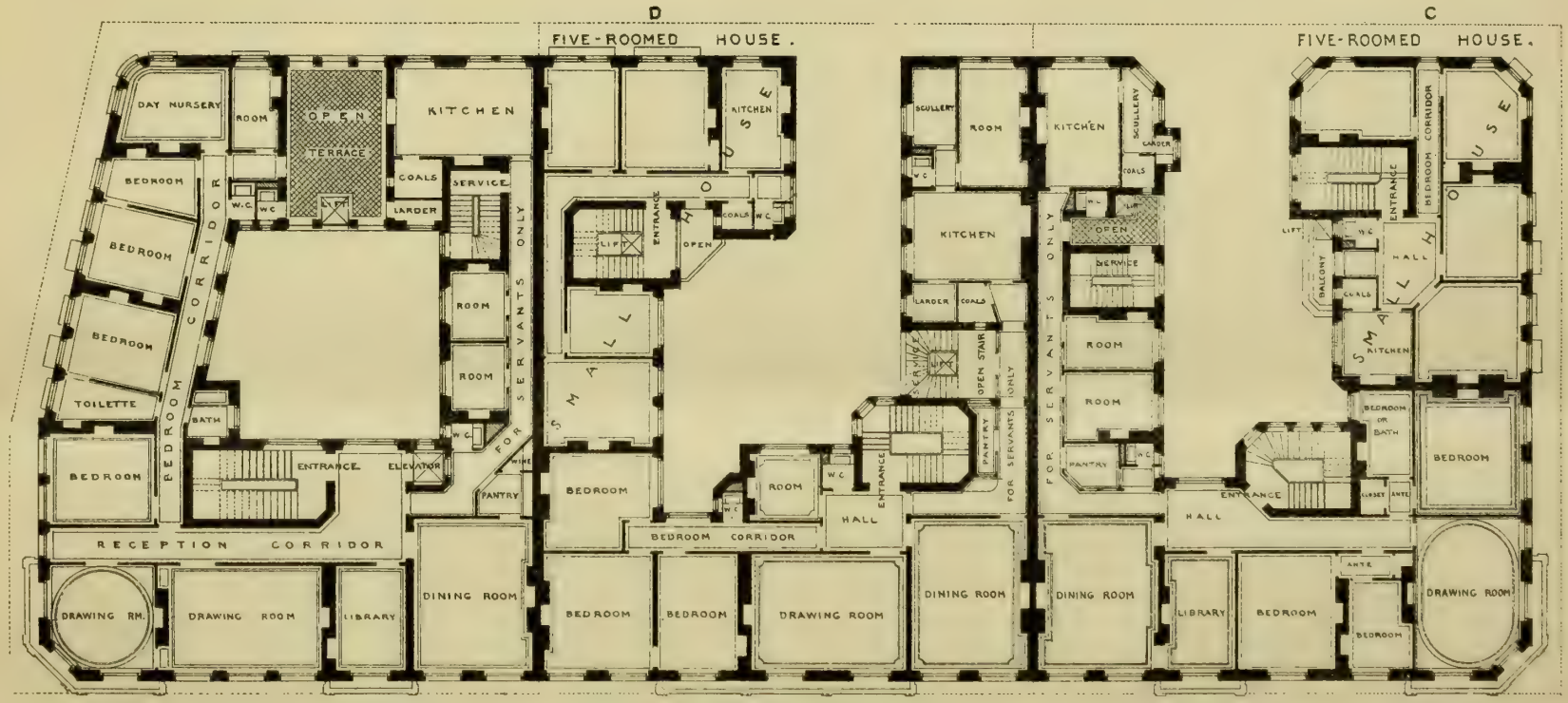
BLOCK A.

THREE HOUSES OF FOURTEEN ROOMS EACH. It will be seen by a reference to the plan that each dwelling-house is divided horizontally into three parts: (1). The hall and the reception, or rather living, rooms; (2). The private or sleeping rooms; (3). The kitchen and servants' rooms. Each of these three parts is distinct from the other: the reception corridor is divided by doors from both the bed-room corridor on one side and the servants' corridor on the other; and the servants, by crossing the open terrace at the back can enter the private or sleeping part of the house. An entrance to the dining room from the servants' corridor permits the dinner to be served without traversing or even penetrating the hall or reception corridor. Equally distinct from the living portion is the gentlemen's water-closet, another for ladies and children is placed in the bed-room portion; the servants' water-closet is entered from the open terrace. The house contains four sitting-rooms, the largest of which, the dining-room, is about 22 ft. by 17 ft.; seven rooms suitable for bed-rooms, toilet-rooms, or nurseries; also a bath-room with a fire-place; on the servants' side, each house contains a kitchen about 20 ft. by 13 ft., a coal-store and a larder; two rooms, each about 10 ft. by 8 ft.; also a serving-pantry and a wine cupboard.

It may, however, be said that the house is built round a courtyard, just as the island as it is was originally built. True, but only the hall, the bed-room corridor, the bath-room, three water-closets, two small rooms and a larder are lighted and ventilated from that courtyard; moreover the courtyard is not closed. I would construct at the level of each storey a terrace open to the external street and the internal courtyard; it would be supported at each end by columns and protected by a balustrade. Such a terrace would be the back-yard, area or garden of each house, with the advantage of a roof; the lift for coals and other household goods would be conveniently worked there, while at the same time many disagreeable necessities like the beating of carpets, the brushing of clothes or boots, and even the washing of dusters or towels could be done on that terrace. Flowers could be trained between the columns, and so long as sufficient space were left for the passage of air the openings both to the street and to the courtyard could be hung with foliage. In this Block A, I have shown a hydraulic elevator, and of it, as well as of the two staircases for the three householders, I shall speak hereafter.

Diagram 11

FIRST AND SECOND FLOOR PLANS.



FOURTEEN-ROOMED HOUSE. A

NINE-ROOMED HOUSE. B

TEN-ROOMED HOUSE. E

Scale of Feet

N B. Three Floors of Fourteen roomed Houses } *Nine Houses.*
" " " Nine roomed " }
" " " Ten roomed " } *Ten Houses.*
Five Floors " Five roomed "

William H. White

Photo Litho'd for the R.I.B.A. by C.E. Kell & Co.

A SKETCH PLAN OF ISLAND AS IT MIGHT BE.

(See Diag. 1)

BLOCK B.

THREE HOUSES OF NINE ROOMS EACH. A reference to the plan will show that, like the preceding houses, each is divided into three distinct parts. There is a central hall communicating by doors with the bed-room corridor on one side and the servants' corridor on the other. The three sitting-rooms, only, open into the hall. In the sleeping portion there are three bed-rooms and the ladies' water-closet. The gentlemen's water-closet is in the hall. The service of the dining-room can be performed without entering the hall; in the servants' portion there is a kitchen about 16 feet by 13 feet, a scullery, a larder, a coal-store, a water-closet and a serving-pantry. There is also a room for servants about 17 feet by 10 feet. The servants' staircase has one side entirely open to the external air; and a broad landing at the level of each storey permits the working of the goods-lift, which is in the centre of that staircase.

BLOCK C.

FIVE HOUSES OF FIVE ROOMS EACH: ordinary dwellings with one staircase and consisting of two sitting-rooms, two bed-rooms, a water-closet, a kitchen and a coal-store. The division of the sleeping portion from the entrance hall is maintained, as a reference to the plan will show. A lift for coals and other heavy objects is placed outside the wall in the courtyard; this lift is approached by means of a balcony at each storey, and consequently it can be worked under cover both above and below.

BLOCK D.

FIVE HOUSES OF FIVE ROOMS EACH: ordinary dwellings with one staircase, which also contains the goods-lift. A balcony is constructed at the level of each storey so that goods can be brought to the servants' part of the house without passing through the private entrance door. The kitchen is shut off from the rest of the dwelling; the two bed-rooms are at some distance from the two sitting rooms. At the same time there is nothing to prevent the four living rooms from being divided into one sitting-room and three bed-rooms. The dwelling also contains a kitchen, a water-closet and a coal-store. No servants' rooms are specially provided either in this block of houses or in the Block C. I shall speak of them presently.

BLOCK E.

THREE HOUSES OF TEN ROOMS EACH. The house is only divided into two distinct parts: the family division and the servants' division. It is intended for a small well-to-do family; it is not planned for the special accommodation of children. An English feature of the plan is that the drawing-room is at some distance from the dining-room, whereas in Paris they usually open into each other, or a small lobby connects them. The living rooms consist of drawing-room, library, and dining-room. The last named is served from the servants' corridor without any necessity of entering the hall. Four bed-rooms are provided and these are arranged in two sets on either side of the corridor, between which and the rooms a small antechamber intervenes. In this is a closet or wardrobe. The two bed-rooms, one of which might be a dressing-room, open into the antechamber. On the servants' side is placed the family water-closet, approached from a lobby behind the dining-room. The corridor then leads straight to the kitchen. A scullery, a coal-store and a larder are provided as well as a water-closet for the servants. Two rooms, 13 feet by 10 feet and 13 feet by 8 feet, both with fireplaces, would make excellent sleeping rooms for female servants. There is also a serving-pantry, and the servants' stairs are reached through a small terrace open to the external air; the goods-lift is placed on that terrace.

Peculiarities of Plan.

There are features in the suggested island as it might be which, compared with the present system of combining shops and houses, are strange to England. But though they are now more French than English some of those features may be traced to houses in London before the Fire. The courtyard which descends from mediæval times, was a thoroughly English institution almost until the accession of the Georges. It was Dutch and North German influence that caused it to go out of fashion. To the courtyard a carriage entrance was necessarily added; it is this broad lofty archway that would obviate the discomfort peculiar to Central London of inhabiting over a shop, and as I have proved it, I hope, to be an economy, the substitution of one large and commanding entrance for several small and mean passages invites a change as practical as it is artistic. The continual modification of the vehicle in which ladies and gentlemen are carried through the streets seems to point to the necessity for covered entrances to houses having been accepted by our predecessors, more especially in this rainy country. Look back to the time when most people rode a-horseback, and the horses entered with their burdens the great doorways of the mediæval hall. Coaches were not introduced till late in the reign of Elizabeth; they only became common many years after. Before then a litter was the vehicle of ceremony, and there are records of great ladies being carried into Westminster Hall—Anne Bullen for instance. A hundred and odd years ago the covered chair was used, and in it a lady was deposited not only on the step but in the very entrance passage of her house. In a novel published about the middle of the last century, a certain Lady Bellaston "was set down in a street not far from Hanover Square, where the door being opened she was carried in," that is to say, in the Bath chair she had hired. But at the present moment in our ordinary houses it is impossible to convey a lady attired for a ball or dinner to a carriage or a cab without exposing her to the elements. The best houses in London, it is true, possess porticos, but their shape counteracts the purpose of their erection, for they do not cover the street pavement; and in summer they exclude the sun, in winter they invite the rain. The continued use of the courtyard by the Parisians has left the street pavements of the French capital unpierced by those pitfalls to be seen in front of every tavern and many shops of our own Metropolis. Neither trap-doors nor coal-shoots render the boulevards dangerous and inconvenient to pedestrians. Nor, if I have read metropolitan history correctly, was it ever intended that the pavements of London should be so pierced. In the rules and directions to be observed in the rebuilding of London after the Great Fire* it was enacted that no such traps or grates should be allowed. A courtyard is the proper place for the delivery of coals and wood, of beer and wine barrels, for thereby the ordinary traffic of pedestrians is not obstructed as it is daily and hourly obstructed in the heart of our Metropolis. I confess that the courtyards of Paris are too often close and stuffy; the best private houses, however, are built round three sides only of the quadrangle, that is to say, the alignment of the street is maintained by a one-storey building in which the great carriage doors are fixed. I do not advocate building round a closed courtyard; my plans show an attempt to keep the inner parts of the island free and airy. In Block A the centre of the courtyard could be marked by a fountain, round which carriages or carts could turn. It may be thought that the noise would cause inconvenience, and when the yards are paved or cemented the noise is very great. In good houses the Parisians use wood. I believe that a wood and asphalte paving is the only proper material for such

* Rules and directions to be observed in the Rebuilding of the City of London:—"That no trap-doors or open grates be in any wise suffered to be made into any such cellar or warehouse without the foundations of the front; but that all lights to be made into any of them be henceforth made upright and not otherwise."—*Stowe*, vol. i. p. 233.

courtyards. In the three blocks of large houses, A, B, E, carriages, entering under the archway, can deposit their burdens at the foot of each staircase and always under cover. In Block A the doors of the elevator are one side and the doors of the staircase on the other side of the entrance passage. The entrance to Block D is also protected though not so effectually: the five-storeyed balcony over it forms a covering to the pavement against which a carriage can be driven. In Block C a square cover may project over the pavement and afford some real protection, but of course in small houses such comforts must be inferior to those of larger blocks.

The large staircases in Blocks A, B, E, are intended exclusively for the members of the three families occupying each block. Those stairs do not ascend to the topmost floor devoted to lumber rooms or to rooms for men-servants, nor do they descend to the basement. Indeed the houses have nowhere any communication with the lowest storey, which is entirely given up to the shops. The servants' stairs, as well as the goods-lift, ascend to the very top of the block. In Blocks A, B, E, rooms are provided for female servants in the houses themselves, but I would give to each house two extra rooms with fireplaces, on the top storey under the second slope of the mansarde (see Diagram III). Such rooms might be inhabited by male domestics, and a clause in the agreement should be inserted to prevent those rooms being occupied by any women-servants. In the small blocks of five houses each it would be perfectly feasible to devote the second slope of the mansarde to five or more rooms, one for each house; and as it is not likely male domestics would be employed in such small houses, five women-servants could be there conveniently lodged.

Were these houses in Paris, three concierges would suffice to keep and guard the five blocks, for B and D command one courtyard entered at each extremity; C and E another, similarly entered. In Paris, however, the concierge lives with his wife and children in the building; and the presence of a family however small, the neccssity for living, cooking and sleeping in a confined space, as well as the obviously unrefined habits of a poor household, so to speak, planted at the very base of the principal stairs, are according to my own experience objectionable. I would not advocate the introduction of the system here. But a club-porter in London is the most obliging, the cleanest and best ordered, of servants. I would therefore place such a block of houses as that marked A in the charge of two men: a day and a night porter who relieve each other. Their own homes would be perhaps in the neighbourhood, but while on duty they would be entirely removed from any connection with their familiar difficulties or delights. I would simply give the porter a wooden box in which to sit and a lock-up in which to keep what few things he requires. The day porter's duty would consist principally in superintendence. He would be responsible for the cleanliness of the courtyard and the staircases, for the maintenance of order in the working of the goods-lift—done by the servants of each house as each servant may require—and he would be the agent of the several families as regards their visitors, their telegrams or letters, and the charge of their houses during absence from home. The cleaning of the staircases, the elevators, the lifts and the courtyard would be done early in the morning perhaps by a man and a woman, who in a couple of hours would make everything bright and clean; and for whose diligence the day porter would be responsible.

There are many little things in our vertical houses which are left to do or right themselves. For instance: we throw dust and ashes into an area or a back garden. In some of our houses there are vaulted cellars big enough to hold a years' vintage of the Château Laffitte, but which conceal perhaps in one corner six dozen of full-blooded port; some peculiarly dry sherry is sometimes visible in another. I have known also a whole row of street cellars in Central London, a few with one ton, others half empty with three tons, of coals. Now I confess that the inhabitants of

houses such as are contained in my blocks must abstain from port and sherry of the old fashioned description, for though nothing would be easier than to provide several big cellars under the servants' staircases in each block, I doubt the necessity for them in these days of light wines and large supply associations. The pantries in the servants' division of the suggested houses are large enough to hold the iron bottle racks now familiar to London, and the latter are always provided with locks and keys. A cellar for coals and wood, on the contrary, cannot be dispensed with; and one of a commodious character is placed in each house. The sacks of coal carried by the lift can be emptied into these coal stores without in any instance being brought into the houses. Where in the houses occurs an open terrace the coal-shoot is placed on it; in others, where there is a balcony, the latter commands the coal-shoot. The best mode of getting rid of dust is a disputed question; some people believe in dust shafts, but I can conceive no way more certain of making houses dirty and offensive than by a dust shaft. It simply means sending the dust of one storey to the level of others below; and if the doors of the shaft on each floor be all open at once, the cloud raised by the general attempt to be rid of impurities defeats the desired end. I have not suggested any dust shafts; I would give to each house a portable dustbin on wheels, which could be placed on the service balconies or the open terraces. Such a dustbin could be carried by the lift, and its contents deposited every morning in the roadway, or the dustmen could at a certain hour call for the same. I think that no condemnation of actual practices and abuses is more needed than the London custom of storing infected house refuse beneath the very noses of the inhabitants.

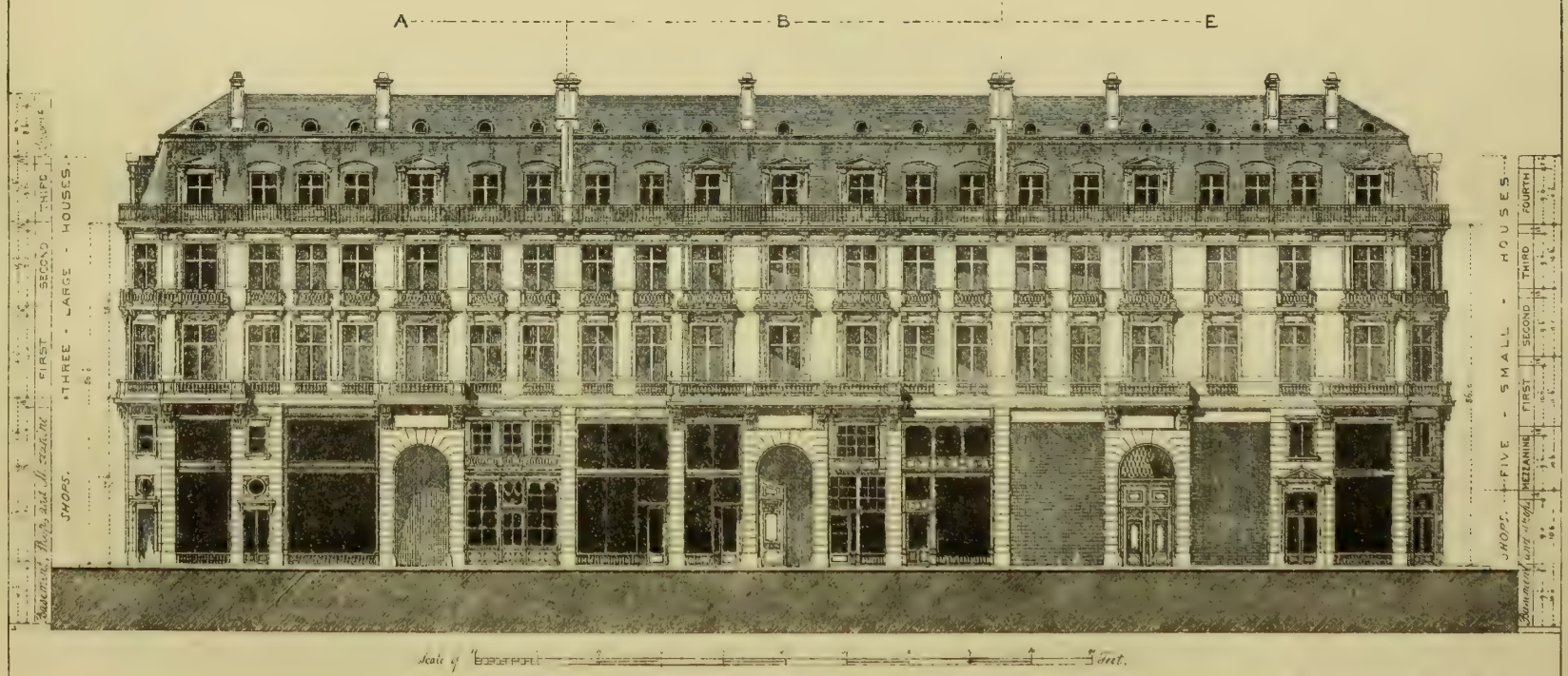
I have something to say about the doors and windows of the suggested houses. Of course, after a certain hour of the evening, the great doors of the carriage entrances, the great gates at the other end of the courtyard, would be closed. When the bell rang it would be necessary for the porter to open them. But this functionary ought not to leave his post in order to open the doors or gates; from his box he should pull a *cordon*, as is everywhere done in Paris. The person entering has only to close the door after him, a by no means extravagant effort on the part of even the most exalted. The porter, without leaving the spot in which it is expected to find him, could see if the person who entered was a *bonâ fide* occupant, or he could inquire for whom the visitor came. Such little things have more to do with the proper organization of superposed houses than is probably believed.

The kind of window has also a great deal to do, both with the gaiety of an interior, and the cheerful aspect of the exterior, of a town house. The effect of weariness, the look of dull care which the streets of London habitually wear, is enhanced by the absence of two things always seen in Paris: a large casement and a white embroidered curtain covering the whole window. The artistic and æsthetic value of the Paris curtain is not sufficiently appreciated here. Both capitals are comparatively remote from the sun, and the colour of a sheet of plate glass deprived of bright light is of a dead and dirty brown. The white hangings behind it destroy that deadness as any one may see who chooses to compare a London with a Paris window, in a street of similar character. The difference, however, is increased by the fact that our Parisian colleagues persist in making large casements opening *together* from top to bottom, while we persist in adhesion to the sash or guillotine, which is said to have been imported into this country in the time of Charles II. Now in many cases the sash is valuable if not indispensable; particularly in small rooms, lavatories, and other places where to open a window in casement fashion would require space. But in sitting rooms and even bed-rooms I hold that the casement is infinitely preferable to the sash. A window that descends to near the floor and ascends to the ceiling, that can be so opened as to permit a volume of fresh air to enter, that enables anyone to look into the street without subjecting neck and shoulders to contortion, is really the logical and scientific window of our time. I know that the sash is said

FACADE DIVIDED VERTICALLY, IN TWO EQUAL PARTS,

FOR SHOPS AND HOUSES.

FIFTY-SIX FEET FROM PAVEMENT TO CORNICE.



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A SKETCH-ELEVATION OF ISLAND, AS IT MIGHT BE.

(See Diags. I & II.)

in England to be the only frame that will keep out climatic discomforts—that the rain always penetrates an English "French" casement, and that the balcony which such a window necessitates is unfitted for fog and rain. But it is well to hear two opinions upon such a subject. Some fifteen years ago I superintended the erection of a house in the suburbs of Paris for an English gentleman who had never resided in England, and who therefore was more English than the English. He required sash windows; after some trouble, after having obtained plans and sections from this country, I gave the requisite full-size drawings of a sash window to the Paris joiner who was employed on the works. The difficulty of making the sashes, the impossibility of obtaining fastenings except from England, the confusion of weights and hangings, were indescribably tiresome. To crown all, the glass inserted in the sashes broke; they would not open, and they did not keep out either rain or fog. The reason of the failure is perfectly plain; to the Parisians a sash window is an entire novelty, and Parisian invention provides no iron or brass furniture adapted for it. That the real French casement is an admirable and a perfect piece of manufacture is proved by the fact that all France and Belgium use it. That it keeps out rain I emphatically assert, for no part of England is more visited with rain than Cherbourg or the neighbourhood of Rouen. At both places some two hundred casements have been fixed under my direction, some of them nearly seven English feet wide; and I could not have dreamed of putting any other form of window in either of the châteaux to which I refer. The truth is, that though English joinery is more carefully made than the French, the ordinary Englishman does not know how to make a real French casement, the wood of which must be of small dimensions, and either oak, teak or mahogany; while the ordinary English smith, whose locks surpass all others in the world, has not yet contrived any sort of fastening comparable to the *espagnolette* and the *crémone** of French manufacture.

It is also maintained that, because the climate of this country is bad, Englishmen do not desire to get out of or even to look out of window. Balconies are therefore useless excrescences. Surely a balcony has a purpose entirely distinct from mere pleasure or taste; it enables the ordinary servant to clean the exterior of the windows, to brush down the outside of the house, and in summer it gives health and freshness to a room. To my mind our London summers, were they but courted, might be made as agreeable as those of the French capital. We begin, however, by believing that both the English climate and the English metropolis are incurable plagues sent us for our mortification; every appliance which in the course of years has served to make the climate of Paris delightful is rejected in London as impracticable or superfluous. If in India Englishmen used the same arguments as they often use here to maintain the Heart of London in its present condition of discomfort, half our countrymen in the Empire would die of heat, dust and mousquitoes before they had time to contract any serious disease.

CENTRAL LONDON: BUILDING RESTRICTIONS.

The Bedford Estate, Strand.

A short time ago, when, by the death of the late steward, the London building land belonging to the Duke of Bedford was left without a manager, it occurred to me that the moment was favourable for making an appeal to the Duke himself on behalf of some of his Grace's tenants, who though forced to rebuild their houses on the old system did not occupy the upper portions of their houses, and who

* For a description and for drawings of the *espagnolette* and the *crémone*, see the "Dictionnaire de la Construction," by M. Chabat (Pierre), Architect, vol. i., pages 380 and 528. Morel & Co., Paris, 1875. It is in the Institute Library.

vainly attempted to let these upper portions either as offices, chambers, or residences. After having mentioned cases which had come under my notice, I said :—

Take another, not a hypothetical instance, in which the leaseholder—one of your Grace's tenants—perceiving the mistake of his neighbours, determines to be wise in time. He will build, not only good business-premises for himself, but also a house fitted for the description of people who are able and willing to inhabit it. He has heard of, perhaps seen a Parisian "*maison-à-loyer*"; he proposes to build over his shop three or four superposed residences, each planned as a distinct home. To do this the piece of land upon which his predecessor, ninety-nine years ago, built a shop as well as his residence above, is not wide enough; a frontage of 18 or even 25 feet to the street is not sufficient. He therefore proposes to borrow two pieces of your Grace's land in order to obtain a frontage of say 50 feet. These are readily granted to him; but your Grace's agent says to the tenant:—"You may have, if you want them, twenty pieces of the Duke's land, but it is on condition that you rebuild, on the very spot where a party-wall has stood for ninety-nine years, another similar wall which shall stand for another seventy or eighty years." That is to say, he may build, if he likes, upon the two pieces, one house; but he must plant, in the very centre of it, a thick wall through which, on the lowest storey, he is permitted by your Grace to make a door. Thus the lessees of land upon the Bedford Estate have no alternative but to erect the old-fashioned house originally intended for a single family. Under this ban many of the houses near Covent Garden have been recently built; and they represent a dead loss to genuine investors. They are gaping for sub-tenants. In some of them, at a lower rental than their cubical contents are worth, chance and necessity may induce groups and individuals to extemporise homes, or open offices; but the result is deplorable. Sets of people come ultimately to occupy the upper storeys of shops and warehouses at a loss to the owners; and to the detriment of property both of house and land.*

The Duke of Bedford was good enough to send me his "sincere thanks" for my communication, but in so doing he said that the views of his agents had been misrepresented in the paragraph quoted above, or rather that he was bound to hold that opinion until he was better informed of the accuracy of my statement. Now such a restriction as that to which I alluded and which used to exist on the Bedford Estate, is an impediment to reform in shop and house accommodation; an architect may therefore very appropriately confer with his colleagues upon the subject, or even remonstrate with the few large owners of our London soil. Such a course was pursued this very day last year in this room. In a Paper treating of house-building and the business requirements connected with it, an Associate of our body described a house he had erected in King Street, Covent Garden, which as everyone knows is upon the Bedford Estate. Mr. Knight's words were as follow :—"With an extraordinary view of the possibilities of future London the agents of the noble Duke required that the building, with a frontage of about 36 feet only, should be so planned as to admit of ready conversion into two dwellings."† And the agents' idea of two dwellings for Central London was—I say, advisedly, was—a house, about 60 feet high, supported on a shop-front 18 feet wide. Anyone who will look carefully at some of the new houses (that is to say, houses erected since 1870) at the Strand extremity of the Bedford Estate, will perceive here and there two new houses occupied by one and the same tenant who has cut through, with the Duke's permission, the thick party-wall he has been compelled to plant in the very centre of the land he leased. In Bedford Street, Nos. 22 and 23, as well as Nos. 29 and 30, have been planned as two old-fashioned houses, though in each case the leaseholder has obviously desired to build one house, for he has made holes in his superfluous party-wall wherever he found it necessary to get from one side of his own building to the other.

Houses as they are and as they might be.

In the appeal I ventured to make to the Duke the necessity of a modified width of frontage was urged on the plea that much of the cubical space now absolutely wasted over the shops upon

* "Houses or Homes? An Architect's Appeal to the Duke of Bedford, one of the nine Territorial Princes of the Metropolis." London, 1877.

† See the Transactions, 1876-77:—"The Influence of Business Requirements upon Street Architecture," (page 20), by Samuel Knight, Associate.

his Grace's estate could be utilised for residential purposes, and to the undoubted profit of the owners. Instead of building upon two slices of land, each say 25 feet in width, two houses—each composed of a shop and nine or ten rooms over it, with two dark kitchens, two servants' "attics," and two water-closets—would it not be better to build upon the two slices, containing together a frontage of 50 feet or 52 feet to the street, one block of buildings? Such a block is shown in diagram IV, in which the plans of houses, as they are on the Bedford estate, are contrasted with those of houses as they might be. The suggested block contains two shops, extending over the whole surface of the site, except those portions occupied by a small internal area, by the staircase and the two entrances to the upper parts of the building. Under each shop, and communicating with each, there may easily be arranged a set of rooms, a lavatory and a water-closet, stores and cellars for the exclusive use of the shop-keeper. The storey immediately over the shops is a mezzanine, and it ought not to be less than 9 feet high in the clear. It is reached through a special entrance from the street by a special stair; and it contains eight business offices, or four sets of offices, a lavatory and a water-closet. Above on the first floor, on the second floor, and on the third floor, there are six distinct town residences, each complete in itself. Each residence is closed by a private door, opening to the staircase landing, as an ordinary house-door opens to the street. Each residence consists of an entrance hall, a sitting-room (17 feet by 13 feet), two bed-rooms and two closets; a lady's pantry, a kitchen and a scullery; a larder, a coal-store and a water-closet; and a servant's bed-room. A goods-lift, from bottom to top of the staircase, communicates with the landing of each storey; coals can be shot into each coal-store from the landing itself. The central staircase can be crowned not only with a skylight, but also a lantern having upright openings arranged both for light and ventilation. The whole block of shops, offices and residences need not rise higher than some of the new ordinary houses on the Bedford estate. To be more precise, it need not rise higher than 56 feet from the street pavement to the ceiling of the topmost house.

A comparison between the revenue obtained for two old fashioned houses and one block of buildings, such as I have suggested, shows an enormous difference in favour of the latter. The revenue from the two houses as they are, each with its two rooms over two rooms, the shop workrooms at the back, and the central superfluous party wall, may be safely calculated in the following manner:—

	£	s.	d.
Shop No. 1, with basement storey of both houses, and the back buildings	350	0	0
Shop No. 2, ground level only	150	0	0
First floor of the two houses	180	0	0
Second ditto	140	0	0
Third ditto	100	0	0
Fourth ditto (for two housekeepers)	nil.		
Total annual revenue	920	0	0

The probable revenue from the shops, offices and houses as they might be is as follows:—

Two shops, ground floor and basement	700	0	0
Eight offices, Mezzanine	360	0	0
Two residences, first floor	140	0	0
Two ditto, second floor	120	0	0
Two ditto, third floor	100	0	0
Total annual revenue	1420	0	0

Calculating the cost of the block as it might be at £2000 more than that of the two houses as they are (all other expenses being equal) the new system shows a clear profit of £300 per annum over the old one, thus:—

	£	s.	d.
Total annual revenue obtained from two houses as they might be . .	1420	0	0
Total annual revenue obtained from two houses as they are . . .	920	0	0
	500	0	0
The increased cost of the houses as they might be, interest on £2000 at 10 per cent. per annum	200	0	0
Balance of profit in favour of the block as it might be . . .	300	0	0

When moreover it is considered that the upper portions of the houses as they are, often remain vacant for months, quarters, and even years—when it is remembered that in Bedford Street, Henrietta Street, and other streets round Covent Garden, entire houses have remained for a year and for years unlet—I think it will be difficult for anyone, aware of the actual demand for small houses arranged on the horizontal system, to shut his eyes to the more than probable advantages I have attempted to point out, especially when his ground landlord compels him to rebuild.

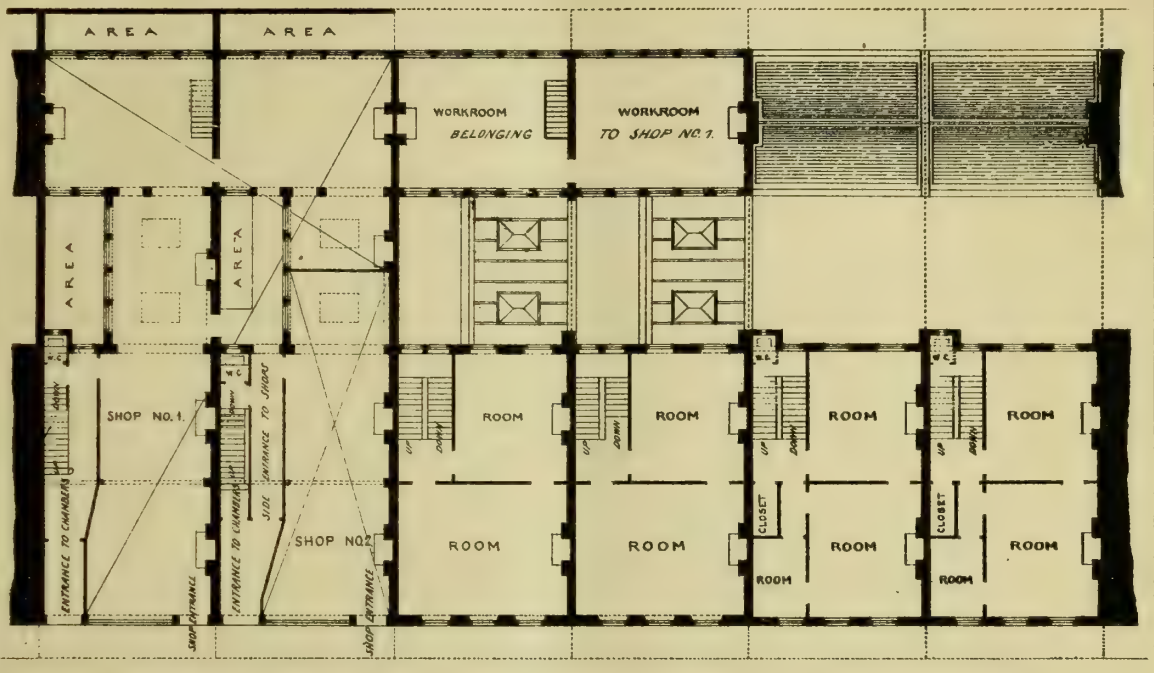
MIDDLE-CLASS "HOUSES-IN-FLATS."

Construction and Organisation.

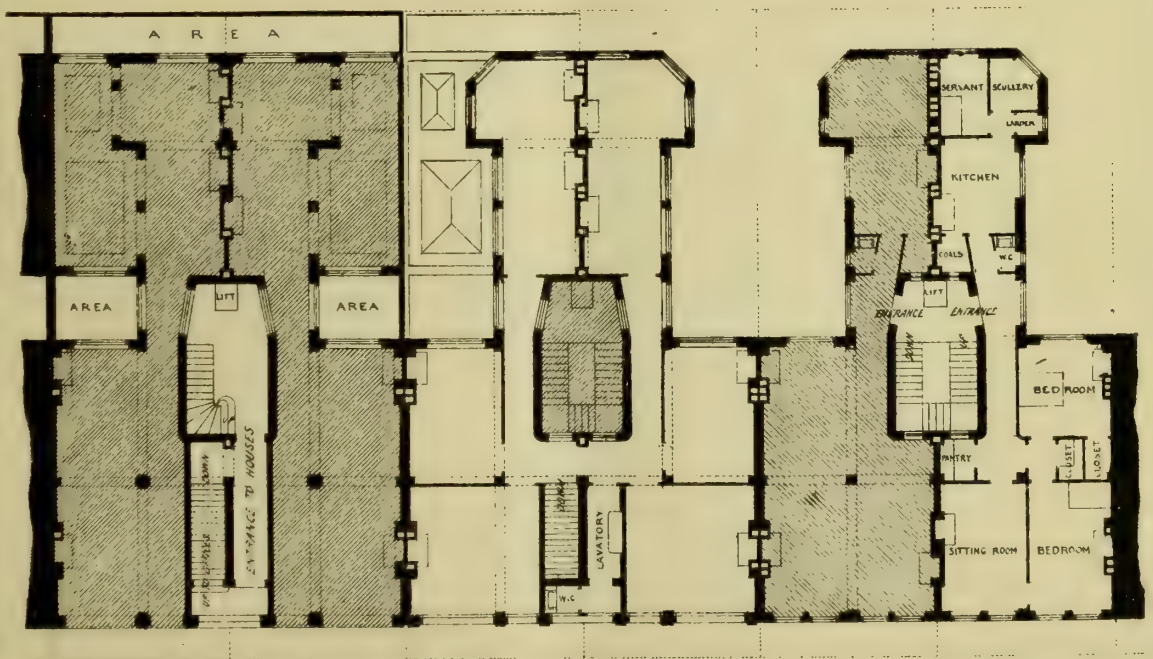
It is a paramount obligation on the part of those who pretend to build "houses-in-flats," that the horizontal divisions between each "flat" be fire-resisting; and it should be remembered that neither wrought nor rolled iron in a naked state resists fire, that oak will burn, and that deal or pine is simply inflammable. To my mind the Parisian system of iron floors is the best, but in Paris abundance of plaster is to be had at a comparatively small cost. There are, however, systems of iron floor construction used in England by which the rolled iron joists are almost entirely enveloped in concrete; and if that concrete be composed of materials that have already passed through fire, such floors may be considered fire-resisting. I would not however introduce much iron into the floors. It will be seen on reference to my plan of the six horizontal houses in Diagram IV, that each house is entirely surrounded with a brick wall, and that in the middle I have introduced a vertical support which runs from bottom to top of the whole building. This support may be an iron column enveloped in fire-clay, or it may simply be a pier of blue bricks built in cement: the latter is preferable. With this support, ten comparatively small rolled joists of different lengths will suffice for the framework of each floor; and the dotted lines shewn on the etched half of the block (see Diagram IV) indicate where those joists should be placed. I would couple them on the French system, and thereby make solid lintels protected top and bottom with real plaster of Paris. The horizontal space between these lintels and the walls should be filled with fire-resisting concrete. Then having roughly plastered the walls and ceilings; having finished the staircase, as well as the public entrance to both the offices and the residences; having closed the building throughout with shop shutters and house windows; having established the position of the water-closets; having put the lift in its place; having fixed the private entrance doors to each residence from the staircase; and having duly installed a care-taker in a box on the ground storey, I would leave the whole building to dry while possible tenants paid probable visits, or offered their own ideas as to the best way of arranging the shops and their basements, the partitions of the mezzanine, and the

THE BEDFORD ESTATE, STRAND.

PLANS OF HOUSES AS THEY ARE



GROUND FLOOR FIRST FLOOR SECOND FLOOR



GROUND FLOOR AND BASEMENT. TWO SHOPS

MEZZANINE. EIGHT OFFICES

FIRST, SECOND, AND THIRD FLOORS. SIX HOUSES

PLANS OF HOUSES AS THEY MIGHT BE *William H. White*

Photo-Litho for the R.I.B.A. by C.E. Kell & Co.

distribution of rooms in the different residences. That is the method which has often been found successful—more particularly as regards shops—in Paris; and it is a method lately adopted in the City of London. But I have not yet seen residential chambers or so-called houses-in-flats offered to the public in such a manner that the whole superficial area of the residence is left free—the entrance, the fire-places, the windows, and the water-closet being the only fixed points therein.

A systematic organisation of the whole block is of the utmost importance. At the present moment it is usual for the landlord of a house to make a bargain with a whole family of a class below that of ordinary domestic servants. They have their lodging free on consideration of taking charge of the house. The consequence is, that this family lives either in the basement or the roof. In one case foul air generated below rises up the staircase and distributes itself in the different apartments; in the other case the foul air of the apartments cannot escape through the staircase because of the heaviness of the atmosphere above—a heaviness to which the lower classes accustom themselves in their homes. As I said before, there is no necessity to house an entire family for the sake of lighting and guarding the staircase. One of the very useful body of Commissionaires is just the man to take care of such a block; he should be made responsible for the guarding, cleaning, lighting, and general superintendence of the public parts of the building. A cellar for coals under the staircase would suffice for the four sets of offices on the mezzanine, and a supply sufficient for the day could be stored in each. The shopkeepers must have, as they now have, their own staff of cleaners. The individual completeness of the six residences leaves to the holder of each the duties and responsibilities of housekeeping. Without going further into details, I think an examination of the suggested internal distribution of one of the six residences—a distribution which can be made with partitions of wood and plaster—will explain many things that perhaps an imperfect description has left obscure (see Diagram IV.)

THE ASPECT OF PARIS AND CENTRAL LONDON.

Reflections obviously force themselves upon people who have inhabited, for a consecutive period, the thoroughfares of both Paris and London, which do not so readily occur to those who, familiar with one capital, know the other only by periodical visits. If it ever become possible, if it ever be deemed desirable to erect, in the centre of our metropolis, houses planned like those I venture to submit to public criticism, the details and results of the Parisian system cannot be too minutely examined. Thus, the general aspect of a city has an effect for good or evil upon the population it contains; and I have often tried to ascertain wherein lay the petty characteristics which make the streets of one capital gay, and the streets of another dull. Why with the majority of travellers does Paris inspire liveliness and a desire to remain in town?—London, sadness and a desire to quit it? Some say it is the climate; and certainly the sky of Paris is brighter during the greater part of the year than the sky of London even in summer. But the atmosphere of Calcutta is much clearer and brighter, seven months in twelve, than that of Paris in June; yet the sun, far from concealing the filth that encumbers the native town of Calcutta, makes it seem filthier—far from brightening the dead walls of loose plaster and rotting paint, the closed shutters and vacant verandahs of the English quarter—only heightens the dreariness and even disgust which the Palaces of Chowringhee arouse in a breast possessing artistic appreciation. The most consummate architecture is incomplete without the constant presence of its maker; only a ruin assimilates with solitude. Buildings, even the most beautiful, must be inhabited before they can present a cheerful countenance. Above the business

level of Central London there must be houses in which families, who desire to live in the heart of town, can reside with comfort and decency. There must be windows that will open, balconies upon which to stand, horizontal divisions that will not burn, staircases lighted, guarded, and cleaned. Did any architect ever place the elevation of a typical London house side by side with that of a typical Paris house? The parlour-window that commands the dustbin and a water-closet in the area; the sheet of stone supported upon iron brackets and called a balcony; the "French" casement that the inmates dare not open; the muslin rag protecting the two lowest panes of the second floor window and called a bed-room curtain; the unfinished female head and shoulders caught in the guillotine of a top window—they are things of beauty in comparison with that other front frowning upon a back garden, in which the dying lilac bush that never dies, shelters a plantation of mustard and cress. Can such a sight lighten hearts? But to partly understand the effect produced on the mind of a traveller by the aspect of Central London, the Londoner should visit the slums of the metropolis on that day when every place of intellectual recreation is closed; while a score of church bells are tolling a hundred housekeepers to prayer; while creatures who, under equal laws and just taxation, might have been decent men and women, crouch in filthy passages and courts, affording a spectacle that cannot be seen in any, even the meanest part of Paris. Yet it was not always so. Little more than a hundred years ago Paris was celebrated for the black and pestilential mud that covered it. The houses in the narrow streets were rotten and dilapidated; the social condition of the poorer inhabitants was not much better than that of the people whom Juvenal handed down to perpetual execration. The improvement of the capital, as it is now, commenced only when the last vestiges of feudality succumbed to the national decree, when the traditional privileges of a minority ceased. Even well-to-do families had hitherto been forced to extemporise homes in worn-out and discarded houses, until an age of great benefactors, whose splendour only a few enjoyed, gave place to one of benefits in which all could fairly participate.

I have sought to show that in spite of much that is said to the contrary, architects cannot alone make architecture; our profession is virtually powerless to render the centre of London habitable as Paris is inhabited. Even if the legislature compelled leaseholders to build substantially for the benefit of their ground landlords, all reform, in the Heart of London, must be abortive which pre-supposes every new house to be the residence of a single family. There is only one practical method of planning houses to be occupied by two different classes of holders; and the restrictions often imposed by powerful landowners or their agents, the varying and conflicting lengths of leasehold tenure, the rooted prejudice even of classes likely to gain by reform, and worse, the circumlocution of English law, oppose a formidable barrier to the introduction of that method. Nevertheless, something may be gained if architects will express a decided opinion upon the sort of building which best responds to the exigencies of trade pursued by one—a non-resident class—and the domestic necessities of another—a resident class—occupying the same piece of ground. For my part I sincerely believe, that the Roman custom, improved by Palladio and developed by generations of Frenchmen, is a system by which buildings can be made to hold, under a scientific distribution of plan—healthily and comfortably—twice as many people as now inhabit the irregularly crowded houses of our bye-streets and slums.

A more extensive and a more radical reform is contemplated by sanguine advocates of co-operation. Excellent Associations, promoted—most of them in good faith—under the Limited Liability Act, have already erected dwellings for artizans and labourers; and similar Companies may also be promoted for supplying the middle classes with similar dwellings. Thus, logically speaking, the centre of London would hereafter be principally covered with huge islands of

barracks, each with its own parade-ground. But at the present hour no Association of the sort deludes itself with the idea of returning a remunerative profit to its shareholders for their outlay and palpable risk. The Peabody Buildings, as we have been told in this room, are not intended to pay a mercantile percentage. Another Society, which must be one of the best—for its spokesman is the chief proprietor of the *Times*, and its adviser is our honoured President—only recently expressed a philanthropic intention not to make more than five per cent. for its shareholders. I venture, however, to think that, by the utilization of actual slums, with careful financial management and legislative aid, houses such as I have attempted to describe, could be advantageously built, not alone for the middle classes, but for the working classes; and that they would return eight, if not ten per cent. per annum on the outlay for cost of land, construction and maintenance. They would possess the additional advantage, which all Englishmen appreciate, of being not barracks, taverns or co-operative hotels, but—purely and simply—homes.

A word in conclusion. I have said some things which many professional brethren who have a greater stake in the country than I, will perhaps condemn; but I have said nothing that has not been urged by others now for many years. The applicability of the continental system to Central London was a favourite subject of discussion among earlier members of our body. One name, which will recall to a few seniors agreeable memories of the past, is linked with former attempts to gain the public ear. The arguments, used twenty-two years ago by the late Mr. Arthur Ashpitel, are still unanswered.* The few crude attempts which have been made since his time,—the domestic residences which have been offered to Londoners under the name of "flats," are, with singular exceptions, as unlike the Parisian model as an English mansarde differs from its original prototype. Happily we still

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* I must not conclude this Paper without a respectful reference to the pamphlet on "Town Dwellings" (London: John Weale, 1855), by Messrs. Ashpitel and Whichcord; and the most convenient way of doing so is to quote from a few paragraphs of their Essay,—paragraphs which may be specially applied to the doubtful benefits accorded to working-men and the poorer classes by the "Limited" philanthropy of the present day. The writers, after urging that to inculcate habits of self-reliance among the poor was infinitely better than to make them charitable presents, went on to consider "whether we are not falling somewhat into a fallacy when we regard and talk of the poor only. However incumbent upon us it may be to look to the poorer classes, it is a great consideration whether there are not some other grades of society that may be equally benefited by the assistance of the associated capitalist; and whether they may not have in some respects equal, if not greater, claims on our consideration. The superior artizan, the shopman, the clerk, the little tradesman, at present inhabit for the most part either lodgings which are liable in a lesser degree to all the objections we have before described, or a class of houses built by speculating builders on as confined a scale, of as scanty materials, with as little sanitary advantages and improvements, as it is possible to give. The class we speak of recommend themselves most strongly to our sympathies. They must be men of more education than the mere operative, and therefore have an appearance to keep up; yet they gain no more than a fair journeyman mechanic. A good bricklayer gets his 30s. a week, or £78. per annum. How many men are there as clerks, book-keepers, superior shopmen, who earn no more than this? How many young men, how many talented artists, how many in every other profession, even curates in the Church, are there who are too glad to realise £80. per annum, and yet who *must* live in respectable lodgings, and wear broad cloth instead of the velveteen jacket? At present they either dwell in small houses run up by speculating builders, or in lodging-houses; and strange anomalous places these last are. Planned for one family, they are inhabited by three or four, who are perforce is some degree associated, however opposite their elements may be; with thin partitions and thinner doors, and scanty general accommodation for all; where anyone can pry into each other's movements, there can be no privacy, no comfort, no home; while the lodger has ever before his eyes the dread of fire breaking out, with the frightful choice of running down a narrow stair of combustible materials, or dropping from a window into the area; thinking over, if he be a scholar, the bitter irony of the satirist that 'he who dwells next the tiles has the consolation of being the last burnt.'"

possess among us Mr. Ashpitel's partner and junior; he, from vast experience in London building, is able to point out the difficulties which environ and impede at every step the introduction of houses to Central London fitted for the present character of its occupation. Nor, in this particular qnestion, should the services of the professional press be overlooked. There is hardly an argument employed or a description given in this Paper that may not be found somewhere in the architectural journals; and perhaps I may be permitted here to record my indebtedness to the earlier volumes of the *Builder*. The time for action is ripe; and if at this moment, while thousands of pounds are being lost to the Metropolitan ratepayers on the vacant borders of our new streets,—while thousands of mean houses, already condemned, await the order for demolishment and reconstruction,—the British Architects will discuss the best means of combining business premises and domestic residences compatibly with modern requirements and a fair remuneration, those who, like myself, hear the private comments of travelled and sympathetic Frenchmen about the state of Central London may yet be spared often a blush and many an impotent regret.

After a few remarks from the President, who reminded the Meeting that, under the new regulations, the Discussion of Mr. White's Paper would not be opened until the next Meeting, a vote of thanks was unanimously passed to the author, and the Meeting adjourned.

Royal Institute of British Architects.

At an Ordinary Meeting of the Session, held on Monday, the 17th of December, 1877, Mr. Charles Barry, President, in the Chair, the following business took place—

DISCUSSION ON MR. WHITE'S PAPER ON MIDDLE-CLASS HOUSES IN PARIS AND CENTRAL LONDON.

Mr. Arthur Cates, Fellow.—It is with regret that I find myself called upon to make the first observations in commencing the Discussion on the exceedingly valuable Paper which has been read by Mr. White; and for this reason—that heartily agreeing with almost all he has said, any remarks I might venture to offer on the detail of his proposal would probably be but the reiteration in another form of that which he has already more ably and more forcibly expressed. At a later period of the evening I should with much pleasure have taken part in the Discussion, and I had hoped to be able then to meet and answer some of those objections which the force of prejudice or more just criticism might have urged against the principles or the details of Mr. White's proposal. He has, from his point of view, so thoroughly exhausted the subject, that little opportunity is afforded for those who agree with Mr. White to do more than declare their concurrence with those ideas which he has expressed in a manner so lucid and so forcible, and has based on so wide an experience gained chiefly on the other side of the English channel in another metropolis:—experience, indeed, of phases of society vastly different from those which surround us in London, but which are, at the same time, the expression of grades of civilisation and culture not to be counted as in any way inferior to those of which we are here accustomed to be proud.

I can, therefore, now only deal with certain aspects of the conditions to which Mr. White has made less detailed reference, and which have relation rather to the social and municipal influences involved, than to the structural or economical details of the buildings, and I hope to show that not only the comfort and health of the individual, but also the magnificence and municipal prosperity of this great city is to a large extent involved in Mr. White's suggestions.

From the simultaneous operation of many causes, but chiefly from what I may venture to call the prejudices, and I certainly think the mistaken ideas of those who *should* be its inhabitants, the heart of this mighty city has, in many districts, fallen almost into decay, and vast areas in central London —indicated on the map on the wall—present to a stranger visiting them for the first time a mournful, grimy, and woebegone appearance, depressing in the extreme—seem to be incapable of improvement, and yearly sink deeper and deeper towards decay.

That this condition of things should exist is a blot on the organization of the city which claims to be the metropolis of a vast empire; and that it exists is no doubt one of the chief causes of those defects and failings which, in many respects, place this metropolis at a lower level of progress than almost every city of Europe.

I do not hesitate to attribute this most regrettable condition of things, in a great measure, to the influence of the now almost universal mania of living "out of town," which is encouraged by the delusion that health is to be gained by sleeping in what is called the "country," but which is too

often, in fact, only an ill-contrived, ill-built, badly drained box, dignified with the name of a suburban villa, planted on undrained land, and surrounded by the emanations from decaying vegetation. To enjoy this "inestimable privilege," he who should be a *citizen and inhabitant* of the Metropolis—which he deserts—exhausts his vital energies by twice daily rushing to and from the railway station and undergoing the toil of railway transit, too often spending the hours wasted thereon in the foul atmosphere of a smoking carriage. Unfortunately for the prosperity of this metropolis, this delusion has been fostered if not originated by the difficulty, or, rather, the impossibility, for those daily engaged therein to find in near proximity to their business suitable places of abode. Mr. White proposes a plan by which it would be possible to house well and healthily, within easy reach of every part of the town, all these individuals and families, in isolated residences, adapted by series to all classes, and thus give the first impulse to that regeneration of Central London, the attainment of which should be the most anxious desire of all who have any interest in the welfare of this metropolis. By the realization of his conceptions, not only would the health, happiness, and well-being of the individual be promoted, but vast sums would be saved which are now wastefully expended in forming miles and miles of streets, sewers, gas, and water mains, in police and other rates, all necessitated by the wide-spreading polypus of bricks and mortar, which, by creating unhealthy suburbs, is fast swallowing up that which should be "country," and drains away the life and energy of the city. The miserable building speculator, under the circumstances, finds too many ready victims as customers for his crazy and unhealthy erections, which they vainly deem to be their "CASTLES," while the population thus spread out, to the injury and loss of every individual, might be more happily and more healthily housed within the city itself, and the mean and woebegone districts, which now disgrace the capital of a mighty empire, might be transformed into brilliant and healthy quarters.

In almost every city in Europe; even in poor much abused Sicily—there are to be found examples of the happy results of enlightened municipal government—and the brilliant architectural embellishment and dignity which is attainable under even adverse circumstances; but only one instance need now be referred to. Take up the plan of Paris of 22 years since, and compare it with the Paris of to-day. The Paris of 30 years since has practically disappeared, has been swept away, and under the wise and enlightened management of its rulers, the city has become the most beautiful and most brilliant in Europe. In that period Paris has undergone troubles and misfortunes in quick succession, such as happily we have had no experience of in this country; but it is still fair and smiling, and even since the siege and the Commune, has undertaken and carried out marvellous works of embellishment and improvements, which put to shame those feeble efforts we are here accustomed,—with blind self-satisfaction—to admire. Of all the agencies which have contributed in various degrees to this end and enabled the authorities to so brilliantly carry out their designs, the MAISON-A-LOYER has certainly been the most important, and has rendered possible that combination and concentration of life and wealth which has produced so magnificent a result.

There is, however, one very serious objection to many of the Paris houses—the small confined inner court,—which certainly needs continually that advent of fresh air which Mr. White so graphically describes as provided in the early morning by the opening of the great gates. In the plan before us Mr. White has with great cleverness avoided this fault, by the arcaded or columned terraces on each story open to the air; he has provided for complete ventilation, and fresh air flows to any part of his buildings.

There is another consideration of high importance with regard to buildings of this character; they must of necessity be erected substantially; they cannot be scamped, and if they become

general, they would do much towards extinguishing the speculative builder who now degrades the taste and injures the health of the people by the wretched structures which insufficient municipal regulations permit him to erect and to call houses.

In one portion of his discourse, although it does not appear to be so directly stated in his Paper, Mr. White, when describing the island in Regent Street, which he has with so much skill selected as the "*corpus vile*" on which to make his experiment, attributed the defects in the buildings now standing thereon, to the shortcomings of the freeholder, or to restrictions imposed by him, and charged the owner of the land with being responsible for all those defects which he characterized with no little force, and some justice. He further stated that the owner of the greater part of the block was "The Crown." Now there is nothing safer or easier than in any matter of this kind to attack the Crown. The Crown is impersonal, and must allow such observations to pass unnoticed; hence, so many seek to gain a cheap popularity by unfounded assertions which enlist the prejudices of the ignorant, and enable them to enjoy the safe pleasure of attacking the defenceless. The Crown is not able to speak for itself, nor is it desirable that it should do so. The other great landowners, whom Mr. White has so boldly challenged, can answer for themselves, and I will ask your indulgence while I, simply as a Londoner, say a few words in reply to Mr White's allegations. I would ask him if he has any idea whatever of the extent of the obligation which this metropolis owes to the Crown, and what western London would have been had not the Crown lavished its funds upon it; let him look at the map of London at the commencement of this century, and contemplate the labyrinth of miserably narrow streets, courts, and alleys which occupied the entire district, from the south-end of Portland Place, along the whole line of Regent Street, to the Quadrant, down Waterloo Place, along Pall Mall East and Cockspur Street, to King William Street, and the West Strand. Then let him consider the stately thoroughfares which have been formed there, solely by the Crown for the advantage of the metropolis; and he may be assured, that if the men who built the houses on the site he has selected had been inspired even in a small degree with the liberal and enlightened ideas which guided the Crown in carrying out their great works, the proposals he now submits to us might have been anticipated, while certainly his severe strictures would not have been merited. Keen critic as he is, I do not hesitate to ask Mr. White if he could realize in his mind what would have been the course of events had the district I have mentioned remained unimproved till the present day, and the necessity for a main thoroughfare from Portland Place to Pall Mall and the Strand had now become urgent? To do this he could only be influenced by his knowledge of the manner in which the authorities to which such works are now entrusted devise them, and to gain this he would no doubt look for instruction to the Metropolis Streets Improvement Act of 1877, passed in the last session of Parliament, and would be guided by what he there learnt. He would find that the first object of those authorities would have been to secure the formation of a "convenient cab-road" to connect the extreme points; this might be straight, but would most probably be tortuous, and its direction would be governed, not by considerations of architectural embellishment, or the dignity and convenience of the city, but by the position of the streets it could be made to traverse, and this "cab-road" would be so contrived that, as far as possible, these streets should be widened on one side only, and the filthy and dilapidated tenements on the other side would be left untouched to stand as continuous defacements of the thoroughfare, and foul witnesses to the course which the *self-governed* metropolis of this mighty Empire thinks best befits its dignity when it proposes to improve its streets. He would, I think, in his incisive style, designate such proceedings as characterized by improvident parsimony and wasteful economy; and he would, on the other hand, be grateful to the Crown, thankfully

acknowledging the noble thoroughfares it has formed as one only of many obligations due to it; now too often overlooked and neglected.

There is one statement in Mr. White's Paper as printed which I cannot allow to pass without notice; on page 31, he says: "But lest my motives should be misunderstood, I beg leave to "say that as the greater part of the island, being Crown or national property, is above the law, so for "more years than I can live, must it remain beyond all possibility or hope of improvement in the "direction to which the makeshift alterations of the actual tenants unmistakably point." I much regret that Mr. White should have allowed this assertion to appear in print; he must have been very much misinformed, on the subject, or he would not have ventured to commit so grave an error. The responsible managers of the Crown Estates have but one anxiety—to promote the welfare of the property and its occupants—and are at all times ready to meet those who may be in a position to effect those improvements which Mr. White ventures so rashly to declare their action renders impracticable. Had he a client prepared to surrender all interests in the island he refers to, I venture to say that the Crown would be happy to afford all possible facilities for the removal of the houses now standing, and the granting of a fresh term of lease for the erection of his combined dwellings. The real obstacle to such operations is not raised by the Crown, or the other great landowners, but by the web of legal restrictions in which the law permits foolish people to entangle property by entail, settlements, and the like devices, which tend to keep the improvable unimproved, and check in every direction all efforts for development. These obstacles would appear to be almost insuperable, except with the aid of empowering legislation specially aimed at them, based perhaps, on the model of the Encumbered Estates Acts, and of which the principle and keynote should be "*salus populi suprema lex.*"

Mr. White will have to encounter deep rooted prejudices—difficult indeed to overcome. We must all wish him success in the arduous task he has undertaken, and not only be grateful to him for the remarkable ability and skill with which he has displayed his ideas before us, but also hope that he may speedily find some enlightened client who will afford him the opportunity to put into execution the plans which he has so carefully elaborated, and practically to test their value.

Mr. Whichcord, V.P.—I desire to say a few words on this subject, and they shall be very few in consideration of the late hour of the Meeting at which we have arrived.

In common with every member of the Institute, I cannot but take great interest in the matter of Mr. White's Paper, and I venture to congratulate him upon the exhaustive manner in which he has treated it. The question, as the author has developed it, has many new features, but the type of building suggested is by no means a novelty in this country, and many of us in our private practice have had the subject under anxious consideration, and various modifications of the system exist in many localities in London. Buildings have been erected for and expressly adapted to the associated housing of different classes of tenants, such as the flats in Victoria Street and the mansions in Belgravia, not to refer to the Albany and similar quarters more especially designed for the residence of luxurious bachelors, all which are habitations for the more affluent. We have also many examples of associated dwellings for the artizan and humbler class of occupants, a subject which has largely engaged the attention, not only of speculators, but also of philanthropists, for many years past, while the intermediate class of tenants have not been entirely unprovided, as is illustrated by the Cornwall Houses in Baker Street, and others.

It is true there is a great difference between any of these and the house described by Mr. White as we see it in Paris, with its interior courtyard and *porte-cochère*, and the system of

horizontally separated houses to contain tenants of different classes under the same roof; this, as far as I know, has not been precisely adopted in London, and I imagine there are two or three prominent difficulties to contend with here in the erection of such buildings that do not exist in Paris or elsewhere.

That self-contained houses, whether in streets and terraces, or detached and semi-detached suburban villas, as we have been accustomed to in London, possess many advantages over the flat is indisputable, but the disadvantages of the cost of such a residence in a central locality, and the inconvenience of distance in a remote suburb, where a moderate rent is attainable, are considerations which, in my opinion, more than counterbalance objections which have been raised to the associated dwelling, scanty as it may be to English eyes in the kitchen and domestic office department: and as London grows larger and wider and land becomes dearer and dearer, it is palpable that the central and more expensive quarters must hereafter expand upwards and not laterally, if persons of anything like moderate means are to occupy them.

In Scotland, although the system of living in flats has been long recognized, I understand that in some of the principal towns the practice of late years has been rather to adopt the English self-contained house, divided vertically by party-walls, and that several prominent examples exist where that has been the case with the ends of the block or street adapted to houses in flats, thus utilizing advantageously the larger external surface for light and air afforded by the terminal house. This is, I am informed, quite a recent idea in Scotland, and it is somewhat suggestive of modified tastes, and while Mr. White commends to us the Scotch plan, Scotland itself would seem to advocate a self-contained house. The same thing may be said of some of the foreign capitals. I lately had occasion to visit Berlin professionally, where I found suburban villages not only projected, but in course of erection, consisting of detached and semi-detached villas upon the English model, illustrating the antithesis to Mr. White's Paper.

Conceding, however, to the full the desirability of adopting some such plan as that which has been advocated by Mr. White for the heart of London, I conceive the difficulties to be contended with are numerous, viz., in the mode of dealing with the land forming the site, the utterly chaotic state of the law in respect of easements and rights of light and air, presenting impediments in the way of raising new buildings to the requisite height, as well as the constructive difficulties and cost of providing lofty buildings perfectly incombustible. Upon the last point, it is, to my mind, essential that security from fire should be absolute, and this can only be attained by somewhat costly construction, if incombustible material be employed throughout, and also that the staircase approaching a series of houses, one above the other, should be in all respects external to the main building, because otherwise, even if the structure would not consume in itself, a casual fire of the contents of an apartment ventilated by the staircase would prevent it from being a safe exit.

Another great element of cost, but a primary necessity in buildings such as those suggested by Mr. White, is the lift or "elevator," as it is called by our American friends; this apparatus in duplicate, one for the passengers and the other for the coals and provisions if a household, is an indispensable and somewhat costly adjunct to each group of houses.

As regards the state of the law in respect of light and air questions, it is perfectly known to most of us whose practice lies in London and towns, that the height of new buildings is practically limited to their existing level, if any neighbours possess windows facing them which are more than twenty years old within a reasonable distance, and that no recognized system of compensation exists by which such ancient lights may be in any respects interfered with. There is also the tenure of the land to be considered. In London the ordinary holding is leasehold, and upon the principal building

estates the usual plan has been to allot plots of from 16 to 30 feet frontage and 80 to 120 feet deep, and to stipulate for party and boundary walls to be erected, maintained, and surrendered at the end of the building term, when the same story will be repeated at a different ground rental perhaps, but keeping up the old boundaries of the original self-contained house. A block for a range of associated houses demands an entirely different shaped plot of land, free from the trammels of the party walls, and although this is a difficulty which the more thoughtful and intelligent landowners and agents will doubtless see and meet, it is yet a source of serious difficulty in practice, as many of us have found to our cost of patience and endurance.

On the whole, I think Mr. White's Paper is a very valuable practical contribution, and one which does him great credit, and suggests thoughts of serious importance to the members of the Institute.

Mr. O. HANSARD, Fellow.—There is one question which I think Mr. White ought to have enlarged upon. He has never intimated in the slightest degree the cost of the block of buildings for the island in Regent Street, which in the centre of London would be very great. The land has to be acquired, the existing leases and the trade interests have to be bought, and if he is to put forward that as a sample of buildings in the centre of London without such consideration, I think his scheme is very misleading. The essential question in proposing such a plan as he has laid before us, admirable as it is, must be the cost. If such a scheme as has been suggested were proposed for the outskirts of London, I can conceive it would meet with great appreciation; but for the centre of the West-end of wealth and fashionable trade, I fear it is not feasible; but I trust Mr. White can prove to us, that within rational outlay, his scheme could be carried out on such a site as he has indicated. I find the site is something like 190 feet by 80. There are twenty-nine houses and thirty-four trades in the block; this is a sample, of course, of West-end property, and when, as I have said before, you have dealt with the freeholder, leaseholders, and trade interests, and erected the block as proposed, I calculate the cost would be between £400,000 and £500,000. Is it a wise thing, without any figures as to the cost before us, to give an opinion upon such a scheme although an admirable plan in itself?

Mr. J. HEBB, Associate.—I have not had the advantage of reading Mr. White's Paper attentively, but I think that the question of the cost of these buildings is a material element in the discussion. I may state that a builder is about to erect a large block of residential buildings in Pimlico—not on the most valuable part—and he estimates that the rent of that building will amount to about £30. per room. Now it is clear that if the rental amounts to a figure as high as this, it will be out of the question for people of moderate means to occupy houses of the kind suggested by Mr. White; and it must be borne in mind, that where you build in the manner he proposes, with the buildings so lofty and full of work, the cost must be greater than where you build houses of low elevation. Perhaps the cheapest kind of building is the ordinary two-storied suburban house, with garden. However we may sneer at the speculative builder, there can be no doubt he knows how to build cheaply. He can give us a cheaper house than we can build ourselves. I defy an architect to build a house in the same manner, and as cheaply. The speculative builders, I consider, have built remarkably well, considering the price they charge for the houses. There are, however, speculative builders of more kinds than one. Some of them employ architects to make them drawings, and I have myself seen very nice elevations designed by architects of some eminence for builders, so that it does not do to decry all that has been done by the speculative builder. With regard to what fell from Mr. Whichcord about the unequal length of leases, I do not look upon that as an obstacle to improvement, because every surveyor who has the management of an estate, takes care that the leases shall expire about the same time.

Mr. H. Dawson, Fellow.—On reading this Paper it appears to me, as I think it must to all of us, that the general ideas which Mr. White has put forward are well worthy of consideration—not that they are entirely new, though to some extent they are so in this country. I limit the question of the want of these residences on flats to Central London, for I am sure, if we attempt them in the suburbs, they will be failures; but if built in Central London, in places where the middle classes of society require houses of that special character, affording, among other advantages, a great saving of servants' labour, they would, I think, be very easily occupied, if only they could be built at a reasonable cost. There are, it appears to me, some important errors in the plans which Mr. White has given us, for these houses in horizontal flats. We must all admit the decidedly clever mode in which he proposes to lay out this island in Regent Street; but notwithstanding that admission, I take it that these plans are proposed to be an unquestionable improvement upon what has hitherto been built in London, and therefore I submit they are in those respects open to criticism. I think that much too small an area has been appropriated by Mr. White for these houses. We are considering them as houses for London—not for Paris or for France. If, instead of adhering so closely to the model of a Parisian house, the plan could be enlarged, so as to give us that accommodation and those home conveniences which our experience of English life tells us the majority of English heads of families would require, they would be just what is wanted for such a house. Looking at these plans as an offered type, I submit that they decidedly fall short of the necessary accommodation I refer to. First of all, with regard to the domestic offices, I cannot believe that any English family would tolerate—unless we are all going to confine ourselves to French cooks—that a house of this description, with the fourteen rooms, and which we are going to let at the rents Mr. White mentions, should be without a scullery and a good larder. Look again at the long dark passages, and the pantry placed in one corner, with no outside light or air. In the next place the sanitary arrangements are defective, for most of the water-closets are without any intercepting lobby to afford ventilation, and some open direct into the hall or landing. Then again, the "Elevator," placed where it is, passes right through the entrance lobby of each flat, which would be a strong ground of objection. All this has been done, no doubt, to economize space, but it is at the sacrifice of proper accommodation. Although I do not follow Mr. Hansard to the extent of saying the plans are misleading; yet, I think we may safely say that they require something like 25 per cent. more space than is put down here to make them come within the reasonable requirements which we in England look for.

Mr. C. F. Hayward, Fellow.—In justice to the author of the Paper, we must recollect that he puts forward his plans merely to show what might have been done as compared with the present disposition of the block or island in Regent Street. Nor need he calculate the cost, as he simply takes such and such a block of houses, and asks whether it would not have been better to have laid it out in some such manner as he suggests:—and so far I think we ought not to allow the term "misleading" to be applied. There is just one difficulty, however, I note, in applying this Parisian manner of building to London, which, perhaps, would not strike every one at first sight, viz.: that these various *porte-cochères* or carriage way entrances to the houses would cut up the pavement to such an extent that it would make the passage along London streets much more difficult and dangerous than at present. Looking at the map, it will be seen, that from Regent Circus to the commencement of the Quadrant, which includes the block or island between Warwick Street and Beak Street, which Mr. White has dealt with, there are seven streets at which the foot passenger would have to take care that he was not run over by the cross traffic. (On one side of the street there are ten of these). Calculating the additional openings required for these carriage ways, in case the

Parisian plan were carried out, and taking the proportion Mr. White has shown in his plan, there would be at least twenty openings instead of seven on the east side of that portion of Regent Street I refer to, and at least as many on the other side, so that you might be stopped in your passage along the pavement at least three times as often as you are now. I take it that these large houses are to be occupied by people who would require carriages and other vehicles, to go in and out several times a day, and it is no answer to say they have an exit at Warwick Street, because this might make it worse, as a vehicle might come in at the back and go out at the front. Taking the word "island" in its literal sense, it is like cutting canals through the block of buildings to afford access, as in Venice, and making three or four islands where there is now only one. If various important streets in London were cut up in this way, it might be regarded as a considerable objection to the plan. In Paris I believe that difficulty is not felt to the same extent as it would be felt in London, particularly in such a street as Regent Street, and I do not see what other answer can be given to this point of difficulty as it has occurred to me. The hour for the closing of the Discussion prevents my remarking upon the adaptability of many of these Parisian arrangements to the Bedford and other estates in London—particularly the systems of "flats," or horizontal disposition of dwellings —only in a modified form to suit the wants and habits of the many people who now desire to occupy them.

THE PRESIDENT.—I am under some difficulty, as we have been somewhat embarrassed by the abundance of matters to-night. The preliminary business has occupied an exceptional length of time. I will however address two or three words to you, and leave Mr. White a few minutes for reply. My observations will naturally commence with words of congratulation to the author of this Paper for having brought so interesting a subject before us. His experience, his long residence in Paris, qualify him to inform us of things not generally known here, although, perhaps, his great sympathy with Parisian life may have led him to go rather in advance of what we should be inclined to approve generally ourselves. His description of Parisian habits of living was most graphic and telling. Then he gave us some interesting memoranda connected with the municipal regulations with regard to buildings in Paris—especially as regards the height of buildings and corresponding width of streets. These are points which at the present moment are engrossing our attention, and for all that we are thankful to him, and from his information we may possibly take a lesson. During this fortnight past I found his Paper so interesting to read, that it is difficult in this short time available to do justice to the multitude of matters treated of, but I must say I came to the conclusion that, though there are a large number of people in London who are bachelors or with small families, to whom these blocks of buildings with residences in flats would be great boons, yet that, after all, does not make up the majority of the representatives of London social life, and as a *pater-familias* myself, I cannot conceive anything more unpleasant than housing a large number of people in suites or flats, mixed up with others above and below. Paris, it must be remembered, is a city restricted by various circumstances in its area, whereas in our own case we have every opportunity of extending the borders of the metropolis, and I think that contributes much to make up the characteristics of English life, which some of us are prejudiced enough to think better than foreign life. Then again it must not be forgotten that Paris is, in a much more distinct sense, the centre of France and French life than London pretends, or desires to be, regarded as the centre of English life: consequently French people desire to live in Paris; they consider it is the only place in which they can live and be happy in their own way, and they are ready to make themselves comfortable there under the special circumstances of the case. Mr. White has asked us to consider a Parisian house, and with many arrangements which we may advise and approve I think we must,

most of us, be struck with the extremely limited character of the accommodation provided, and which does not commend itself to our English feelings and habits. I, for one, am not prepared to believe that our English servants would be content with an apartment of 10 or 12 feet square, or a little more, but which shall be substituted for kitchen, scullery and butler's pantry all in one; nor do I think we should ourselves be content with the small space allowed for storing wine in a closet instead of laying it down in the way we are accustomed to in cellars, where it may mature by time. Mr. White is a revolutionist in every sense of the word: he not only wants to revolutionize the arrangements of our houses, but to entirely alter ourselves in all our wants, habits and mode of life. Then, again, he spoke of French thrift, as instanced by ready-money payments for articles daily consumed in the house, the purchase of which was to be personally conducted by the mistress of the house. In Paris there are many divisional markets, but in London we cannot entertain the idea of the housewife going to Smithfield to purchase meat or to Billingsgate to buy fish: that would be simply impracticable. In directing attention to these points I am sure Mr. White will forgive me, inasmuch as it has arisen from having paid that attention to his Paper, which I cannot doubt he would desire. Although these objections have struck me, at the same time I am ready to acknowledge that there is a large section of Londoners to whom these flats would be the greatest boon, and I should be glad to see, with the help of the Crown (which Mr. Cates has practically promised), the experiment tried on some scale sufficiently large to test Mr. White's theory. I have no doubt whatever that his skill would be equal to the occasion, but I should like to have the opportunity of witnessing its results: and, as he says at the end of his Paper, he thinks it possible to erect houses for the middle classes in London, which, after paying all demands and outgoings, shall yield a return of 10 or 12 per cent., he will, no doubt, be able eventually to effect the revolution in our dwellings which he desires, since such a return on our usual system, is, at least, difficult. My own experience goes rather to contradict, in some measure, Mr. White's suggestions. He suggests that Englishmen are willing to live in French houses. Possibly it may be so to some extent, but I have had some experience myself, if not in Paris, at least in Turin and Vienna, and I have found that the cry there is, "Give us English houses; take away those dreadful flats and dreadful staircases, on which you are constantly being confronted with the occupants of the houses, above and below, and let us have our dwellings only for ourselves." It comes almost to this—we are all, whether English or French, prone to be more or less discontented with what we have, and to fancy that what we have not is better.

Mr. WHITE, in reply, said,—I am much obliged to you, Mr. President and gentlemen, for the vote of thanks passed to me at our last Meeting, and for the attention which has evidently been given to my Paper. Some of the questions since put have been answered by those who preceded me; and I am indebted to Mr. Hayward for having kindly answered those of Mr. Hansard. I never wished to bring forward a model plan of "flats." I have simply attempted to shew you houses as they might be, which would be more comfortable and remunerative than certain houses as they are; and the illustrations are confined to Central London. A few words on the general subject! Nothing helps the cause of reform more than intelligent opposition, and nothing is more dangerous than opposition which springs from misconception or perversion—I do not say wilful perversion—of a reformer's argument. I will explain my meaning by describing an analagous case, and imagine a meeting of barristers with a learned Judge in the chair. They are met, say, because it has been alleged that a certain amount of crime is apparent in a particular locality in Central London. One barrister rises and makes a suggestion which, if carried out, would extirpate from that particular locality, murder, robbery, and other crimes! The learned Judge interposes—he says: "My learned friend has made a suggestion which, if "carried out, would seriously affect our national habits." Now, it might

be thereby inferred, that our national habits consisted partly of murder, robbery, and other crimes. Yet a fortnight ago, when I pointed out that in one particular locality in Central London,—that is to say on those, not spots, but masses of grey (pointing to a map of the Heart of London on the wall)—there are houses in which whole families, groups of individuals, and single individuals, are living, perforce, in a state of higgle-de-piggledy confusion, with no possibility of maintaining ordinary privacy: in a condition which is neither more nor less than contamination, physical and moral. somebody, I think it was the President, said, or rather implied, that it was a serious thing to interfere with English family life. Am I to understand that the typical lodging house of Central London represents the family home of this country? Then it has been suggested that in such a house as I have planned the newly-married couple, would be prematurely annoyed by the cries of that unwholesome family which always has measles in June, and whooping-cough in November. But such a state of things actually, at this very hour, exists in the ordinary lodging house of Central London. There you will find the middle-aged batchelor, the erratic youth, and the unwholesome family meeting on a common stair, and with their apportioned rooms dovetailed, so to speak, into one another. Yet we are accustomed to the saying, often arrogantly expressed, that an Englishman's house is his castle. So it is in the admirable houses of Grosvenor, Portman, and Bedford Squares; but in that part of the plan coloured grey, can you say that each of the houses is an Englishman's castle? Whereas, if they were built on the Parisian system each family might have its own castle, with a portcullis on the stair-landing; for in Paris the castle boast, were it ever made, would be a justifiable one.

I wish to refer for a moment to my plan of houses as they might be on the Bedford estate. It has been urged, elsewhere, that it would be much better—I grant it in certain cases—to live in a suburb in a house at £50 a year, taxes included, than to occupy a "flat" on the Bedford estate at £70, £60, or £50 a year; but nobody is so foolish as to plan and erect houses in Central London for people who prefer to live in the suburbs. It is certainly astonishing to find families in Paris willing to pay £1000 a year for a few rooms on a boulevard, when we know that at Neuilly, or Vincennes, they might have a whole house for one-tenth part of that sum; when we know that at fifty miles from Paris they might have each a small château and a small park for a twentieth part of that sum. But ever since the world formed itself into communities—at Athens, at Rome, at Florence—the heart of a capital city has been thought by many men to contain all that makes life worth living; all the wit of one sex, and all the beauty of the other.

My plans have been attacked on sanitary grounds, and I have no doubt that they are full of defects. I admit that there is in one of them a great apparent waste of passage-room. In one of the Regent Street blocks there is shown upon each of the three storeys a flat house of fourteen or fifteen rooms (see Diagram II., Block A). Take a vertical house with the same number of rooms; with three rooms on a storey there would be five storeys, and that would compel eight flights of stairs and eight landings—not to mention passages and lobbies. Place each of the flights of stairs and each of the landings, one in front of the other, on a horizontal surface, and see what a length of passage-way you will get. By the vertical system of house accommodation you must climb that passage-way, while on the horizontal system you walk it like men. Moreover, the length of passage-way enables an architect to contrive a certain amount of isolation. In all existing "flats" there is little or no distinction between the different portions of a dwelling; there is no separation between the bed-room accommodation, the day-room accommodation, and the kitchen accommodation. A long passage promotes that isolation. Again the height of the façade is another important point; and two architects—well-known men—have told me that my

suggested houses are not high enough. That is just what I wanted them to say. I have simply contrasted my blocks with blocks of building that exist; I have obtained in the Regent Street example 40 shops and houses instead of the 20 shops and houses actually covering the Isand as it is (see Diagram I.), and with a height of 56 feet from pavement to cornice. Raise that height 10 feet, to the height of a Paris house, and you obtain 21 shops and 24 houses, healthily and comfortably, instead of the unhealthy and inconvenient shops and makeshift dwellings now existing on that black block which you see (pointing to the plan of the island as it is). This is not a sweeping reform; it is simply development. Yet I have not only been called a revolutionist, but I heard some-one in the background call me a "radical." To call a man a "radical" is to lower him in the esteem of that numerous tribe of Dulness which subsists upon the privileges of one half of the community and the abuses of the other. While repudiating any claim to that title, I may say that the question for the present is more a political than an artistic one. Once settle the politics of it, and there is enough genius in the country to settle the artistic part. You must reform—it will be done, no doubt, within the next 50 years—the law of leasehold; you must cut off the custom of entail, and, as it has already been urged, you must have a real law of light and air. You may call me a radical; but while I also trust that Providence will leave us still our "old nobility,"—more particularly because upon certain of our old nobility, and not upon architects and builders, depends the improvement of London architecture and the improvement of many thousands of homes in Central London. Before, however, the reforms, which must inevitably take place, can be carried out, some amelioration of present evils is likely to take place if the ground landlords of Central London can be induced to study their own particular interests:—if they will but consent to put money into their own pockets by laying out their vacant plots of land upon a scientific basis. Permit me though to add, in conclusion, that they do not consult their particular interests or even put money into their pockets by driving, as some of them do, hard bargains; by extorting short leases; and by obstructing, at every turn, the march of public improvement.

The Discussion on Mr. White's Paper having thus been brought to a close, the President invited Mr. James Neale, Associate, to read his Paper on "St. Alban's Abbey." (*For which see next page.*)

ARCHITECTURAL NOTES ON ST. ALBAN'S ABBEY.

By James Neale, F.S.A., Associate.

It is now seven years since I measured a bay of the thirteenth-century work on the north side of the nave, with the hope of passing the examination as a student of the Royal Academy. Being successful, I continued the study. After some months work, often from sunrise to midnight, I gained in 1875 the "Pugin Travelling Studentship" and afterwards "The Silver Medal" of this Institute.

The time of the Studentship was almost all given to St. Alban's. I had then gone so far in accumulating drawings that some antiquarian friends suggested their publication. This well-intentioned advice has in fact led to a continuance of this pleasant occupation for three more years. However, I am now happily able to look for the completion of my task by the publication of my volume in the course of a few weeks.

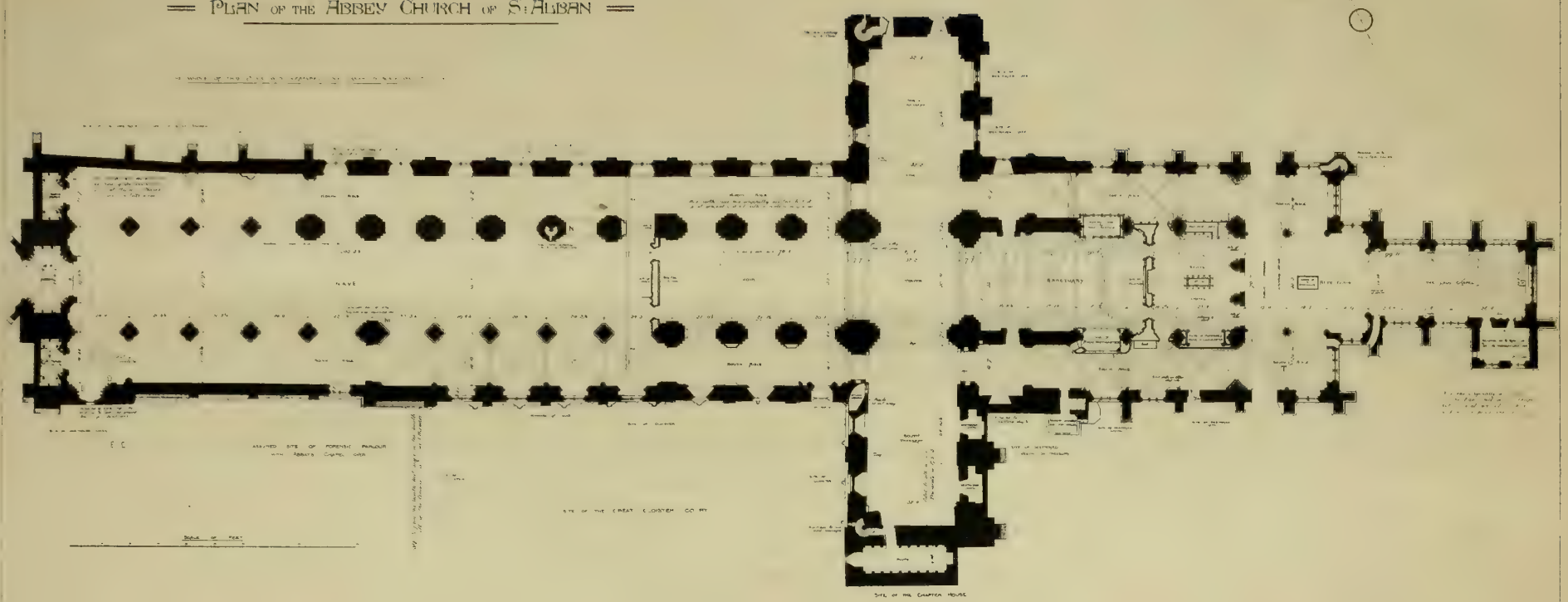
When I began I did what is so usual: measured carefully, worked out the drawings at home, getting the scale and general character. I soon came, however, to consider this a mistake, and recommenced with the determination that everything should be drawn to scale on the spot, every joint shown, every moulding taken the real size. This I have adhered to, and have much pleasure in bringing some portions of my work before the members of the Institute, who have encouraged me by appreciation, reward, and criticism.

My first intention was to start at the west end, and take an imaginary walk through the building, noting on the way the architectural features in the order of their date. I found this too extensive. Bearing in mind that I am addressing many who know well the general history of the abbey, I will endeavour to keep clear of such well-trodden ground, and simply give notes on special points, and ask some questions that may lead to discussion helpful to myself and to others.

THE NORMAN CHURCH.

Tradition relates that about A.D. 303 a man named Alban was beheaded on a gently sloping hill outside the city walls of the ancient Verulam. Also, that the early Christians built a church upon the spot of the martyrdom; but nothing of importance is recorded until Offa II., king of the Mercians, founded a monastery there in honour of St. Alban, about the year 793. He placed the monastery under the rule of St. Benedict. Between the time of its foundation by Offa and the invasion by the Normans, this monastery was governed by thirteen successive abbots.

Plan of the Abbey Church of S: Alban



From The Abbey Church of S Alban
by J Neale E S A
(by permission)

Photo Lithographed & Printed by James Akerman 13 Queen Square W C

The re-building of the early church, which had been contemplated for many years, was delayed until William the Conqueror, in 1077, appointed Paul of Caen to the Abbacy.

Abbat Paul was a relative of Lanfranc, Archbishop of Canterbury, who was Abbat at St. Stephen's of Caen at the time of its erection in 1064. Lanfranc rebuilt Canterbury almost upon the model of St. Stephen's. Paul, who was simply a monk at St. Stephen's, more ambitious, rebuilt St. Alban's on a similar plan, but on a scale vastly exceeding either Canterbury or St. Stephen's.

	St. Stephen's, Caen.	Canterbury.	St. Alban's.
Number of bays in the nave . .	9	9	13
„ „ „ choir . .	2 besides the apse	2 besides the apse	5 besides the apse
„ „ in each transept	2 and 1 apsidal chapel	2 and 1 apsidal chapel	3 and 2 apsidal chapels
Total length from east to west —about	290 feet	290 feet	460 feet
Total length across the transepts from north to south—about	145 feet	145 feet	189 feet
Length of nave taken from west front to west face of transept —about	193 feet	193 feet	284 feet
Length of western façade—about	90 feet	90 feet	possibly about 150 feet

Abbat Paul's church consisted of a nave, with its side aisles,—transepts, without aisles,—choir, with side aisles,—sanctuary, with side aisles and apsidal termination.

Floor Levels.—Paul adapted the levels of the floor to the levels of the site. The floor at the east end seems to have been about 6 inches above the ground line adjoining, and the floor at the west end about the same amount. The slope of the hill downwards from the East thus allowed a difference of 4 feet in the floor levels. But he was not contented with this: the slope from the north southward was also echoed: the floor is thus 2 feet 6 inches lower at the south than at the north wall of the transepts. These floor levels have been frequently modified, but their influence has been considerable on the fate of the building. One of the constant aims from the thirteenth century onwards was here, as elsewhere, to increase the prominence of the high altar. It was ultimately elevated 3 feet 6 inches above its original level; but the Norman levels in the sanctuary aisles have probably always been maintained, and they dictated the floor levels of that great extension of the eastern arm, which occupied the century in which mediæval art was attaining, and attained its greatest excellence. A sufficient elevation was obtained for the high altar without the necessity of a crypt, which so frequently formed a feature in the design of the earlier churches.

Materials.—The Norman church was built of tiles collected from the ruins of Verulam. Some measure 21 in. by 12 in., by 2½ in., but the average size is 17 in. by 12 in., by 1½ in.; they are of a deep red colour. The mortar joints in all the Norman work are in some instances thicker, but as a general rule a little thinner than the tiles themselves. The possession of so immense a bulk of ready made material excluded stone from any considerable portion of the building; a few shafts and a few capitals, and the impost mouldings of the ground-storey and triforium arches were for constructive

reasons made of Barnack stone, but practically the whole of the building was constructed with Roman tiles. Probably the massiveness of walls and piers was to some extent due to the unlimited supply of tiles.

Cushion capitals occur in the transepts and tower. These may very possibly be the earliest capitals of this form remaining in England. The division of Norman work into earlier and later, by Mr. Edmund Sharpe, the former terminating about the year 1090, would bring the whole of this church within this earlier period, when "cushion" capitals are very rare—at any rate if we accept the statement in the *Gesta*, that Abbat Paul built the entire church during the first eleven years of his rule; that is from 1077 to 1088.

Consecration.—It is difficult to accept, without some scepticism or surprise, the statement that the Church remained unconsecrated for nearly thirty years. Finished in the eleventh year of Abbat Paul's rule, its consecration is stated on the same authority to have been deferred till the eighteenth year of his successor Abbat Richard de Albeneio, and the fifteenth year of Henry I., A.D. 1115. Troublesome times, or special circumstances, may account for a course so unexpected; but, in truth, one is not inclined at any stage of the building's history to pin one's faith on a chronicler—however admirable in the main—who must have largely resorted to his inner consciousness for his information.

THE SAXON BALUSTERS.

As to the plan, or state of preservation of the early church in 1077, we have no proof, but it is certain it was no mean structure; and the Normans, although erecting an entirely new building for some definite purpose, retained parts of the destroyed one. It is not improbable this might have been done partly to create a kindlier feeling, and obtain more willing assistance from the Saxons.

These relics seem to have been arranged with considerable care in the bays of the triforium arcading of the sanctuary and transepts. Those in the sanctuary would be removed when it was partly pulled down and wholly remodelled in the thirteenth century, but those in the transepts still remain. These balusters are complete in themselves, each having a shaft, capital, and base; but in order to lengthen them, the Normans added capitals and bases. These additions contrast with the original columns in workmanship, material, and design. The new capitals and bases were worked with the axe (as was all the other stone throughout the Norman Church).

The whole of the plain and moulded surfaces of the original balusters are *worked smooth*—evidently turned in a lathe. Some of the marks of the turning tools are very fresh. It would thus appear that they could never have been used externally in the Saxon church. The rest of the circular shafts—used alternately with the Saxon ones—are of the Norman period, as indicated by the stone and axe marks; they are not turned, but axed vertically.

During the late restoration of the Saxon church on the Castle Cliff at Dover, and also that at Jarrow-on-Tyne, a number of these curious balusters—which had also been re-used by the later builders—were exposed to view. Some of the moulded bands of the Dover balusters exactly correspond with the St. Alban's mouldings. Those at Jarrow have a multiplicity of mouldings, consisting mainly of *flattened beads* without the variety of detail found at St. Alban's and Dover. Fragments of similar balusters were recently discovered at Ely Cathedral with mouldings of the same character as those at St. Alban's, and the marks of the turning-tools are very clearly visible.

ABBAT JOHN DE CELLA'S WORK IN THE WESTERN PORCHES.

The Norman church retained its original character till Abbat John de Cella (1195-1214) pulled down the West front.

Floor Level.—In commencing, its reconstruction he made his floor line in the porches about 3 feet 6 in. lower than the original floor of the nave of the Norman church. This new level also appears in the north and south aisles. In the north aisle the bed for the tile floor remains against the stone bases of the piers between St. Andrew's Chapel and that aisle. In the south aisle a similar bed exists in the arch leading to the south-west tower, and, at least, for a few feet further eastward. It is possible, though one thinks hardly probable, that De Cella—who seems to have been somewhat venturesome in his undertakings—may have vaguely contemplated carrying this lower level along the nave some considerable distance further eastward. It is equally possible that he did not intend to carry it further eastward than the eastern portion of the western bay of the nave, rising to the general floor level by means of a flight of steps. This last has, for some thirty years last past, been believed—without very much foundation—to have been De Cella's intention;—a belief that is likely to embody itself in a solid form ere long—with a flight of steps from the north of the north aisle to the south of the south. For my own part, the floor levels north and south previously mentioned are difficult to forget. There is in them not only materials for conjecture as to De Cella's intentions, but incontestable evidence that the north aisle retained, till the destruction of St. Andrew's Chapel, the floor line which De Cella had marked out when he started on the western front. For about 70 feet from the western wall the north aisle must have been reached by a flight of steps on the aisle side of the ground-story piers; whether this lower floor extended further eastward than this, new excavations will determine.

Porches.—The western porches are found to contain, when critically examined, interesting evidence as to the manner in which succeeding builders completed a design which had been carried too far for material alterations, except in the details. De Cella put in apparently all the foundations, but thereafter threw all his energy on the northern side. In his time the northern porch was entirely completed. This porch has mouldings of extreme delicacy, some enriched with the *dog-tooth*. There is a carved boss at the junction of the diagonal vaulting-ribs, now much mutilated, but the foliage remaining resembles that of some of the Lincoln choir bosses. One stem is twisted spirally and terminates in the centre; the whole of its interior is hollowed out, and the mouldings of the ribs carried behind. In the central porch he did not, however, succeed in carrying out his design higher than the tops of the main columns. In the southern porch there are scarcely any architectural features due to De Cella. A beautiful holy-water stoop was inserted in the north porch in the early part of the fourteenth century. This porch would naturally be used by the laity coming from the town on the north of the church.

ABBAT WILLIAM DE TRUMPYNGTONE'S WORK IN THE WESTERN PORCHES.

Abbat Trumpyngtone took the central and southern porches in hand and speedily carried them to completion. All the new mouldings above the capitals of the central porch and nearly the whole of the mouldings of the southern porch have the same character;—there are fewer members in the groups and the mouldings are coarser in themselves than those in the northern porch. There is no

dog-tooth in either of these porches. The carving in the north porch and the earlier carving in the central porch has peculiar overlapping curling leaves and strongly defined stems, and is singularly like that in the choir of Lincoln Cathedral. The later carving in this porch and the whole of the carving in the southern porch is the normal *Early English* foliage. From this it will be seen that the northern and central porches differ largely from the southern porch. The omission of central bosses from these vaults both differ from the northern porch.

I have specially aimed at making clear this interesting matter of chronology by my drawings, so that the architectural student may follow almost year by year the erection of these most beautiful works. There are in the central porch evidences of individual preferences, over and above the evidence of the change in *style*. As far as was compatible with maintaining the work already erected and carrying it to a logical completion, Trumpyngtone made modifications in the framework of the design that are hardly credible. For instance, De Cella contemplated reproducing the jambs of the central porch on the nave side, with their clustered marble shafts—thus giving it a greater depth and importance than the lateral porches. But Trumpyngtone built in the two doorways between the clustered jambs. The jointing of these doorways does not range with the jointing of the original jambs.

In mediæval work it was not unfrequent for stones already prepared to be used at a later date. This occurs in the central porch at St. Alban's, but with this difference from other instances;—a difference, as far as my observation goes, making the case unique. Trumpyngtone used stonework prepared by De Cella, but cut away the minor mouldings. De Cella had not worked the whole of the vaulting ribs; Trumpyngtone was unwilling to supply what was wanting with copies of De Cella's stonework. He was equally unwilling to throw aside the stonework already prepared;—this strange piece of self assertion is the result. Judging from the carving and the forms of the mouldings I think the earlier parts of the porches at St. Alban's are a few years later than the choir of Lincoln, and therefore 1200-1205. In the western porch of Ely Cathedral the general design of the lower wall arcading, and of the clustered jambs, is similar to the central western porch at St. Alban's—but the less undercut mouldings, the withered crumpled carvings, &c., of the Ely porch point to a later date—probably about 1225.

THE WESTERN TOWERS.

Cutting down his predecessor's work was rather a custom with Trumpyngtone. The porches might have been sufficient for many men, but in the work of the intended western towers he did something equally vigorous. At the western end of the north and south aisles the letters A and D D on plan refer to the remains of the arches from the aisles into the towers.

The archway on the north side was destroyed at the time of the fall of St. Andrew's Chapel, with the exception of a portion of the west jamb. On the south side the arches and jambs are more perfect and the original design of John de Cella (1195-1214) is there exhibited. The alteration of the character of the design by his successor William de Trumpyngtone (1214-1235) on continuing the work is also shown. In the jamb prepared by De Cella, eight clustered marble shafts were arranged for, and six smaller stone shafts, slightly recessed, in the intervals between these marble shafts. De Cella's design is also traceable up to the level of the marble annulet moulding. At this level he discontinued the work. Trumpyngtone carried up the smaller stone shafts to the capitals, but entirely omitted the marble ones.

The dimensions of the western towers can be ascertained from the foundations, and their height when further progress was arrested may be supposed to be shown by the height of the existing

work. There is weight in the suggestion of the Rev. H. Fowler, that the western towers would almost certainly have been named in the Records if they had ever been complete enough to form part of the floor of the building. In truth the existence of Norman towers—now a mere conversational commonplace—should rest on a more solid foundation than the tile and flint work found under the ground level, which might be of any century. The total destruction of St. Andrew's Chapel might fairly justify an argument for a north-western tower as advanced as that on the south. But to suggest more than this; to describe, for instance, both the towers as "crowned with roofs of steep pyramidal shape, the most ancient form of covering applied to features of this kind," &c. (Buckler, p. 99) would require a temerity to which I cannot lay claim. In August, 1877, after the removal of the modern brick cottage (which abutted against the western end of the south aisle wall) the ground was excavated for the foundations of the new buttresses of the south aisle. A part of the foundation of the eastern wall of the south-western tower was exposed (marked E E on plan). This wall is 10 feet thick composed of flints and Roman tiles, and may be a portion of the work of John de Cella.

TRUMPYNGTONE'S WORK IN THE NAVE.

The Casing Theory.—Messrs. Buckler in their admirable book, "*The Architecture of the Abbey Church of St. Alban*, 1848," make a special point of the method of the change from the *Norman* to the *Early English* work. They say "the Norman walls were not wholly demolished, but the massive tile work was reduced in sufficient proportion to allow it to be cased with ashlar." It is also added that the transformation commenced at the top, continuing downwards. A comparison (see section looking north herewith) of the Norman and early English bays will show what miracles of cutting away in the triforium and clerestory passages would have been necessary; and, as a further consideration, the ground story piers, 19 feet 4 inches high, would have been reduced from about 10 feet square to octagons of 2 feet 9 inches across. [The total dimension across the pier is 6 feet $3\frac{3}{4}$ inches. The shafts project from the face of octagon $12\frac{1}{4}$ inches. The width of octagon is thus 4 feet $3\frac{1}{4}$ inches. Supposing the stones are 9 inches on bed—less than the average which I find —2 feet $9\frac{1}{4}$ inches is the greatest width of the octagon tile core.] The supposition that such transformation began at the top and continued downwards might derive support from the eastern bay of the clerestory, and from the strange form of the east pier of the ground story, but the mouldings are actually later in date, stage by stage, from the ground story upwards.

These considerations ought to be sufficient without the others which could be urged. In my opinion the whole casing theory is a work of high imagination without any—even the slightest—support from actual facts. It has the credit of having beguiled well-meaning people against their better judgment for a goodly term of years. Messrs. Buckler had not the art of stating a conjecture with appropriate slightness; and what may have been with them a piece of sober guessing has become by lapse of time a matter for grave belief.

Minor Changes of Purpose.—Nothing is more natural to the practitioner of any art than a recital of changes of purpose. Readiness in adaptation to fresh circumstances, or new ideas, are not less virtues to day than in the thirteenth century. Trumpyngtone, however, was an *enfant terrible* in architecture, and exposed with frankness what is usually concealed with care. I have mentioned some of his tampering with De Cella's designs and details; and I shall now have the pleasure of recording some of the curtailments of his own. When he commenced the rebuilding of these bays on the north side of the nave, he prepared the base mouldings of the main piers to receive filletted shafts, but the shafts were carried up as plain rounds, without the fillets. One of these

bases was used and still remains *in situ* to the westernmost pier of the easternmost bay on the north side of the nave. When it was decided not to remove the half of the Norman pier on the eastern side of this bay, the three upper courses only were built upon the Norman work. The base, not being required, was cast on one side. After the idea of the filletted shaft had been given up, we find Trumpyngtone still tried to enrich the plain shafts by dying them on to an octagon, at the base. When erecting the two easternmost of the *Early English* bays on the south side, the piers were worked without either octagon or fillet, but a base previously prepared—but not required on the north side—was now used on the south.

Nave Vaulting.—Trumpyngtone intended to *vault* the nave, and (on the section) we still see marble vaulting shafts in the spandrels of the ground story arches, and the abacus at the triforium level cut away to allow the shafts to pass. The clerestory piers on the north side of the nave have sinkings designed to give shadow behind the intended shafts. When the rebuilding had proceeded on the north side as high as the springing line of the triforium arches, Trumpyngtone determined to forego the vaulting and substituted a wooden roof. The two easternmost of the five *Early English* bays, on the south side of the nave, were erected some little time after the three adjoining bays and the four bays opposite on the north side. This is evident from the marked change in the mouldings. There is also no preparation on these two bays for vaulting the nave. The piers of the clerestory are not hollowed on the face, as is the case in the piers on the north side. The clerestory arches to the easternmost bay are enriched with the *dog-tooth.* This ornament does not occur in the rest of the clerestory—an additional instance of the minor retrenchments beyond those previously mentioned. Trumpyngtone, on continuing the work of De Cella at the west end, retained the Norman floor line in the nave. He also adopted the top of the surbase of the new porches as his porch floor line. Thus he only required two steps up to the nave. The necessity for steps to lead down into the aisles, in consequence of the retention of the higher floor level, has been dealt with above.

DECORATED WORK IN THE NAVE.

The Casing Theory again.—It has been stated by Messrs. Buckler and others that the original Norman work remains in the massive pier on the south side of the Nave (see M. on plan) and that in the thirteenth century the western half of this Norman pier was cased with stone; a similar course being again adopted with the eastern half when the fourteenth century bays were erected. The tiles and flints which appear in the triforium passage have no doubt given rise to this theory, and it has been adopted by one writer after another without special consideration. It is true there is Roman tile in the centre of this pier, but the component parts of the mortar prove the core is not the Norman work—but that the builders re-used the tiles (which were on the spot) as far as practicable, and in keeping with the new architecture. The interior of the Lady Chapel walls are mostly of Roman tiles and flint. This is another instance of the later use of the similar materials obtained from destroyed portions of the original structure. The different mortars used at the various dates are all easily discernible. The mortar of the decorated work is very hard and contains more lime than the Norman mortar.

The erection of the Decorated Bays. After the fall in 1323 of the Norman Bays on the south of the nave, Abbat Eversdone immediately commenced the rebuilding, and it is to him that we are indebted for the design of the five *Decorated* Bays eastward of Trumpyngtone's work.

I think these *Decorated* Bays on the south side of the nave, and the Lady Chapel, are clearly proved to be works of the same period; for in the small niches in the jambs of the Lady Chapel Windows are exactly the same mouldings to the bases and to the capitals, as to the Decorated Bays in the nave. These moulded bases to the niches in the Lady Chapel are only 1 inch high, although those in the nave are about 1 foot 5 inches. Again, some of the carving is precisely similar in design, the style of the hair and also of the moustache and beard being identical with that of the heads in the nave. Also the same peculiar ball-flower occurs in both the nave and the Lady Chapel. The carving in the nave is indeed much bolder, and worked with a firmer and more decided hand than that in the Lady Chapel. This fact, and many other features, would lead one to conclude that the five *Decorated* Bays in the Nave are rather later than the Lady Chapel, although designed by the same architect.

At Eversdone's death, which occurred at the end of the year 1326, the rebuilding had probably reached as high as the floor of the clerestory passage, and all above this level was continued by the succeeding Abbat, as indicated by a change in the character of the mouldings, which are more shallow and flattened in their outline. The general design is however almost upon the model of the thirteenth century bays, and the arches are more acutely pointed. This seems to have led one writer after another into the error of attributing these bays to 1275. The date is only discoverable with certainty by means of the details.

Other changes of Purpose. It seems clear that Eversdone intended the triforium piers to consist of three principal and two smaller intermediate shafts. The mouldings of both the capitals and the bases were worked, prepared for such smaller shafts. This, doubtless, would have a pleasing though severe appearance. However, to enrich the effect, these intermediate shafts were afterwards carved with bold four-leaved flowers, arranged alternately, some circular, projecting to the line of the original shafts, while the others were worked receding and flat. By this ingenious arrangement, which also occurs in the carving of the triforium string, much variety and depth of shadow are obtained. Parts of the original intermediate shafts still exist, adjoining the capitals and the bases. Even these parts, in two or three instances, were carved, but as the result was not very happy, the rest were left in their original condition.

It was also intended that the label mouldings should simply die into each other (as in the *early English* bays). Carved heads, as terminations to the labels, were afterwards added so skillfully, that a very careful examination can alone discover them to be an afterthought. All these alterations were doubtless made in order to equal, or possibly to out-do the richness of Trumpyngtone's work, and at the same time to make it more in keeping with the enriched architecture of the age. Much of the carving is now almost as perfect as the day it left the artist's hands, and evinces the greatest depth of feeling in the carver.

Walls at the backs of the Triforium Arcade.—An assertion was made some years ago that "the walls at the backs of the early English and Decorated arcading were introduced when the steep roofs of the aisles were removed." This assertion has been frequently copied; but the triforium arcades were never, as generally stated, entirely open, and for the following reasons:—

1. The stones of the arches over the triforium, bond with the walling at the back of the passage.
2. The masonry joints of the asserted filling-in are continuous with the piers.
3. The mortars used in the external walling, and in the arcade, have the same component parts.
4. There never was any relieving arch or double arcade to support the clerestory wall above (as at Westminster Abbey) which would have been essential had the walls been pierced.
5. The corbels on the south side of the nave, which carried the timbers of the roof over the

aisle, are arranged irrespectively of the piers, and some occur in the walling, said to be the filling-in of the arches.

6. It is evident that the small doorways (still existing) which led from the passages into the roofs over the aisles, and also the corbels are of the same date as the rest of the arcading.

THE CHOIR AND NAVE ROOFS.

The roof which covers the space between the rood screen and the tower is formed of twelve principals, having tie beams and centre posts. The scantlings of the tie beams average 15 inches by 12 inches, with a clear bearing of 40 feet. The beams, which project 3 inches below the ceiling boards, are chamfered on the lower edge, and by means of these and of painted decoration, the whole surface is divided into panels. The whole of the nave ceiling was treated in the same manner, but at some comparatively recent date it seems to have been necessary to repair it. To save morticing and tenoning the new ceiling joists, boards were simply nailed to the underside of the original beams. A flat unbroken surface was thus given instead of a surface broken by projecting beams, as in the choir. This flat surface, 211 feet long by over 30 feet broad, was divided into panels, in imitation of the more ancient design, by daubing in strong colours.

The greater part of the original beams still remain within the roof, above the ceiling boards; they are morticed for the ceiling joists, and chamfered exactly the same as the choir beams, and fragments of the original painting are discoverable. Only a few new beams were inserted.

The eastern half of the twelfth beam, westward of the tower-arch, belongs to the earlier design, but its western half is wholly covered with the ends of the boards of the flat ceiling (see on section). The choir ceiling boarding is of chestnut. Part of the old boarding was re-used in the nave, but the greater portion is in thin deal. In the centre and the western parts of the nave ceiling the joists are rudely sawn out of moulded and decorated beams; and braces to wall pieces, painted with stripes and stars (as in the choir) are re-used as common timbers. Towards the eastern end of the nave there are indications, under the present distemper painting, of an earlier design. The pattern of this seems to be somewhat similar to that of the present daubing, but the panels are smaller. This may possibly be fifteenth century work on some of the old boards re-used in the alterations.

There is much difficulty in deciding whether the roof timbers are of oak or chestnut. Some are clearly of oak, but I am inclined to think the greater part is chestnut; and the opinion is favoured by the fact that the forests of Hertfordshire abounded in chestnut trees.

This ceiling—which is 40 feet wide—is not flat, but rises about 1 ft. towards the centre; this is obviously for the purpose of hindering the beams from appearing to sag when viewed from the ground.

THE RECENTLY DISCOVERED DECORATION ON THE CHOIR CEILING.

During the summer of 1875 the choir ceiling was repaired, and the *distemper* painting touched up. Whilst replacing one of the panels, a workman accidentally rubbed some of the new paint, and beneath it indications of an earlier design were brought to light. One by one the panels were cleansed by peeling off the outer coat of distemper, and a painted design of much beauty was exposed to view.

This ceiling consists of sixty-six panels, arranged in eleven rows of six panels each. The two central panels of the middle row contain representations of our Lord and the Virgin, in each of the other rows three of the panels are charged with shields supported by angels; the three alternating panels bearing monograms ꝟꝺ surrounded by wreaths and vine leaves.

On the coloured drawing (which I introduce as the frontispiece of my forthcoming work on the

South Elevation

Site of Tower

Site of Abbots Private Chapel

Remains of Cloyster

The Great Tower

The whole of this Elevation was measured and drawn to scale in the field

Sanctuary

Ante Chapel

The Lady Chapel

From "The Abbey Church of S. Alban"
by J. Neale F.S.A.
(by permission)

Section looking North

Scale of Feet

Nave

Choir

Tower

Sanctuary

The Saints Chapel

Ante Chapel

The Lady Chapel

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of the arches.

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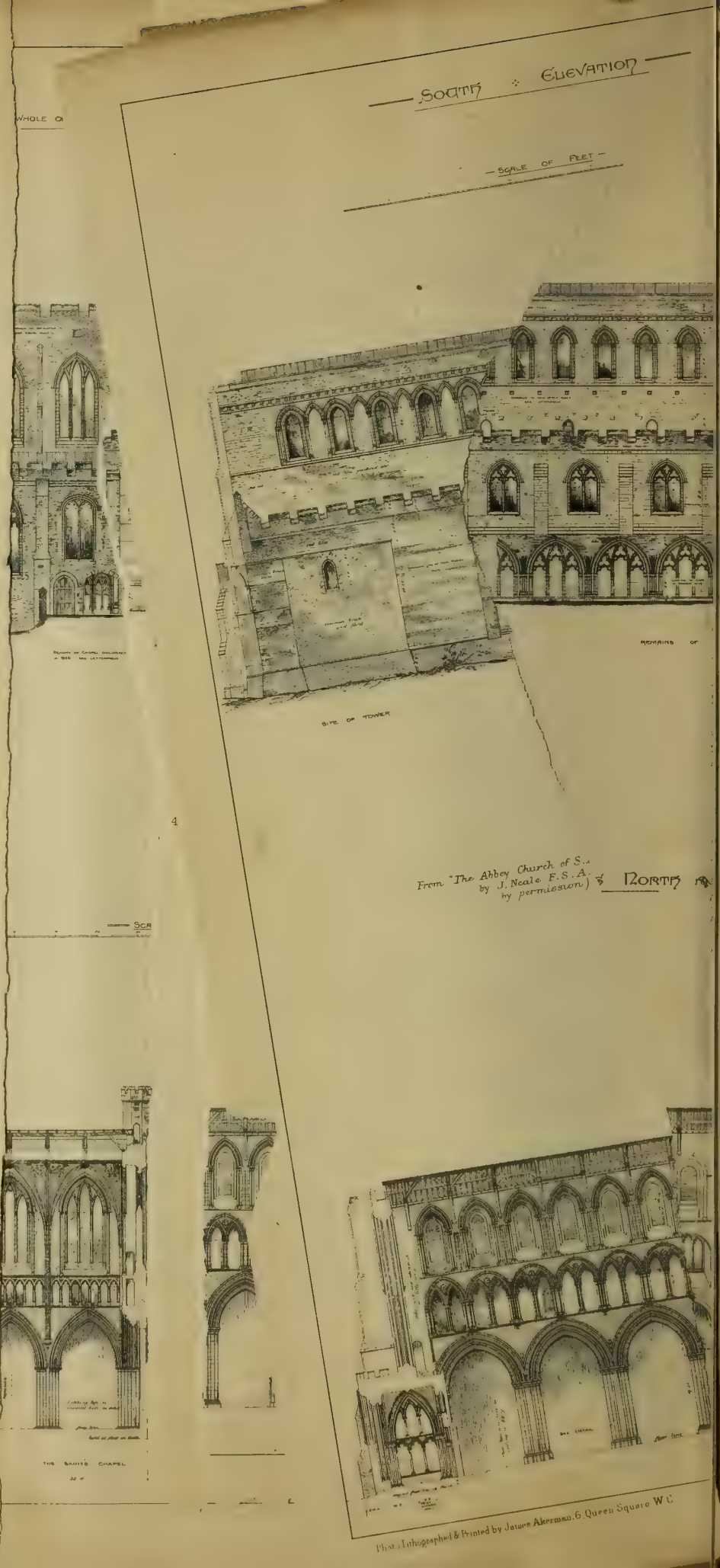

Photo-Lithographed & Printed by James Akerman, 6 Queen Square W C

Abbey) will be seen a copy of a panel in the first row from the west end. The date of the painting has been put at between 1368 and 1376. I am disposed to think it is much later, because :—

1. The painting is on the main beams and panels of a low pitched roof. The bosses which occur at the junctions of the panels are the original ones, and are certainly much later in date than 1376.

2. The style of the lettering of the inscriptions points to about 1440.

3. The peculiarly designed lions in the shields on this ceiling, strongly resemble those used elsewhere in the middle of the fifteenth century. With reference to the two centre panels in the middle row the evidence of a later date is still stronger, for the canopies are embattled. The base mouldings of the throne, the mouldings of the canopy, and the drapery of the cushion, point to the middle of the fifteenth century.

I think that this fifteenth century painting is not (as generally stated) in oil colour, but that the colours were mixed with spirits of wine and shellac, for we find after the lapse of over 400 years the colours still retain a brilliancy unknown in oil painting. Colours mixed by this method are more durable in themselves, but the body of paint is more disposed to be brittle than in those prepared with oil. The painting on the choir ceiling where defective had chipped away, and not worn or faded.

THE SANCTUARY.

The apsidal sanctuary of the Norman church, with the exception of a few alterations by Trumpyngtone (1214-1235), seems to have remained entire until 1257, when it was found necessary to pull down the whole of the eastern part of the church. At the rebuilding, which was immediately commenced, about 50 feet of the north and south walls were left standing in order to form buttresses to the great tower. All the work eastward has been removed.

The square east end of the new design was built upon the connecting wall which crossed the Norman church at the springing of the apse. On setting out the plan of the new design the two first bays occupied the space between the tower and the second Norman buttress to the eastward. Sufficient space was not left between this point and the east end for four bays of the same width (to make six in all). Three bays somewhat wider than those to the west were therefore erected (to make five in all)—*see on plan.* In the three eastern bays seven arches occur in the triforium arcade in each bay, in lieu of six as in the two narrower bays—*see section.* The vaulting shafts over the new bays continue down within the spandrels of the ground-story arches, but the vaulting shafts over the bays containing blank arches, stop at the triforium string.

These bays of the sanctuary were erected just at the change of the style from the *Early English* to the *Decorated.* The latter style was not sufficiently far advanced to bring about an alteration in the outline of the clerestory windows.

THE EASTERN CHAPELS.

During the excavations in 1872, a cylindrical hole sunk in a block of stone was discovered in the south aisle of the ante-chapel (marked "T" on plan) ; in this hole was found the lid of a small wooden box of oriental workmanship, which probably contained the heart of the builder or special benefactor of this chapel. The manuscript in the British Museum states that, although the body of Roger de Nortone reposed elsewhere, yet his heart was buried before the altar of S. Mary of the four tapers, in the south aisle of the ante-chapel. This documentary evidence confirms what the architectural details and mouldings would have led us to conclude, namely : that the southern portion of the ante-chapel was erected during the Abbacy of Roger de Nortone (1260—1290). Some

portions of the ante-chapel are characteristic of a few years later, notably the mouldings of the eastern window in the north aisle. These, most likely, were a continuation by the succeeding Abbat, John de Berkhamstede (1201—1301).

I am disposed to think that when the works eastward of the sanctuary were commenced, the foundations of the whole of the eastern chapels were inserted at one time. The courses of the masonry and the similarly moulded strings are continuous the whole way round the chapels. The sanctuary and the ante-chapel made rapid progress towards completion, but at the time of the accession of Hugh de Eversdone, in 1308—a period of fifty years from the insertion of the foundations —the lady chapel walls had only reached the level of the underside of the window sills, a height of 10 feet above the ground.

During this period, architecture had greatly developed, and the change in the mouldings and other details, clearly prove the work could not have been continuous. In corroboration of this we have the record in the *Gesta Abbatum*, where Hugh de Eversdone is described as having "brought "to a praiseworthy completion the chapel of the Sacred Virgin in the eastern part of the church, "which had been begun many years before." Eversdone is also mentioned as having roofed the nave of the ante-chapel: "Moreover that place contiguous in the shape of a square chapel, "separating the sanctuary from the said chapel, with a ceiling, in the midst of which the Assumption "of the Blessed Virgin is figured" (where the shrine of St. Amphibalus is now placed), "he at the "same time took pains to finish." From this we gather that the vaulting of the ante-chapel was really never carried above the stone springers. Hugh de Eversdone, abandoning the beautiful features of the *central* nave and aisles with their vaulting, removed four of the piers, cut down the stone springers, and covered in the space with a panelled ceiling, and thus entirely altered the design of his predecessor. We gather from the records that Hugh had much difficulty in obtaining money. No doubt he was anxious to complete the ante-chapel, which had been exposed to the weather for many years, and thought it would be wiser to do so quickly, even at the sacrifice of a portion of the original design. The Lady Chapel of Hugh is so rich in detail that it might have been suggested that he was anxious to bring his own individual work into increased prominence, and therefore purposely impoverished the ante-chapel. Hugh had just completed the ante-chapel and a part of the wall arcading in the Lady Chapel, when Master Reginald, a clerk at the Court of Rome, bequeathed 200 marks.

"The Lord Abbat Hugh, receiving this money, laboured so earnestly for the completion of "this work that in a short time he had, to the honour of the glorious Virgin, finished the roof "with choice timber and an arched vault, and most beautiful glass windows—a magnificent sight; "Walter of Langleie and Alice, his wife, helping the Abbat in the cost."

Some few years since, when the Lady Chapel was used as a grammar school, this vaulted roof being somewhat shabby, laths, plaster and whitewash were applied on the boarding. The lath and plaster is now being removed, and some painted decoration is exposed to view. The group of chapels thus completed offers examples as exquisite as it is possible to find of two of the most interesting phases of English Mediæval Architecture. The earlier portion is hardly equalled in beauty of design by any contemporary work, while the traceried windows, wall arcading, and clustered piers must be ranked amongst the most perfect specimens of the period anywhere remaining. If the first ideas had been fully carried out it would have been still more beautiful.

The modifications are by no means improvements. Some of the mutilations—especially the cutting away of the springers and the flinging aside of the vaulting demanded by the forms of the work already erected—betray a hardihood that might have made Trumpyngtone blush for his own

meekness. There is a courage in botching, and sometimes in dispensing with the endeavour to botch —that would in a modern person be deemed evidence of ineptitude; even I fear if he showed that he had such powers of design as are seen in contemporary work in the Nave and Lady Chapel here.

THE RECENTLY DISCOVERED SHRINE AT ST. ALBAN'S.—IS IT THE WORK OF JOHN DE MARYNES (1302-1308)?

Some 300 years ago the beautiful shrine of the Protomartyr was shattered by sacrilegious hands into thousands of pieces. These pieces were used with the common rubble masonry for walling up the arches at the eastern end of the Saints' Chapel, when the public passage through the church was formed. When these arches were opened out in the spring of 1872, about 2000 fragments of Purbeck marble were discovered. Under the guidance of Sir G. G. Scott, these fragments have been ingeniously put together by means of shellac, and the structure was found to exactly fit the marks in the pavement in the centre of the Saints' Chapel—traditionally regarded as the site of the shrine of St. Alban.

The ordinary shrine consisted of three parts: the pedestal, the feretrum and the canopy. The feretrum, or actual shrine, which contained the relics, was at times carried in procession. There are no remains in England of either a feretrum or canopy. The most perfect remains of pedestals are those of Edward the Confessor, in Westminster Abbey, and Thomas de Cantilupe in Hereford Cathedral; both of which somewhat resemble the shrine of St. Alban. There are some portions of the shrine of St. Etheldreda at Ely, St. Werburg at Chester, and of the Patron Saint in St. David's Cathedral.

The pedestal is of Purbeck marble with the exception of the vaulting to the niches, which is of clunch stone, and painted. The general dimensions are about 8 feet 6 inches long, by 3 feet 2 inches wide, and 8 feet 4 inches high from the top of the steps to the cresting. Mr. Ridgway Lloyd in his pamphlet ("The Shrines of St Alban, &c."), attributes it to the time of Abbat John de Marynes, chiefly on the authority of a reading in the *Gesta Abbatum*. "Abbat "John de Marinis caused the tomb and feretrum of St. Alban to be moved, whilst decorating it "nobly, and expending on it more than 160 marks." De Marynes died in February, 1308. If by the end of 1307 the whole was completed, we may safely infer that the *pedestal* must have been completed before this time. The mouldings, the carvings, &c., do not, however, contain a single detail that would identify this work with so early a date.

1. The carving is later and more naturalesque than that in the Lady Chapel (circa 1320).

2. Some tracery on the sides of the niches has the same peculiarity as the tracery of two windows in the north wall of the Lady Chapel; but of a still later form.

3. The earliest specimen of good 'flowing' tracery is in the restored portion of the choir of Ely Cathedral, by Alan de Walsingham, commenced in 1322, but this is not reticulated work; whereas that in the shrine is thoroughly so.

4. I fail to find elsewhere rosettes of so early a date as 1307 identical with those on the shrine.

5. The finials have the same descriptions of *crumpled* foliage as those of the east window in the Lady Chapel—but of a later character.

We all well remember the incident of the Lincoln Chapter House—related by Mr. Sharpe—also that of Peterborough Cathedral. These and others of a similar nature must tend to confirm our conviction that the stones speak more truthfully and must be trusted in preference to any written record.

Unfortunately it seems to have been a frequent custom for a chronicler, whether intentionally

or through carelessness, to credit a favourite man with work he never did. Mr. Edmund Sharpe, when visiting me at St. Alban's, fully confirmed my notes and suggested that this structure might be the monumental tomb erected in honour of Eversdone—the Abbat who had built and beautified the Lady Chapel. This opinion I was not inclined to accept, although I am convinced the date of its erection was not prior to Eversdone's death in 1326, and cannot possibly be of the time of John Marynes.

IS ST. ALBAN'S THE LONGEST CATHEDRAL IN THE KINGDOM?

For many years past it has been stated, and with local pride, that St. Alban's is the longest church (now Cathedral) in the kingdom, and each history of the building has gladly availed itself of this tradition.

Good amount of length and other dimensions go to the making of grand architecture, and these are, therefore, not to be lightly spoken of. Still, of course, this controversy is a little trivial. Unless the length involves superiority in other ways as well, and the whole are discussed together, a little matter for whimsical drivelling is provided and nothing more. However, at the risk of incurring some of my own censure I will give the result of no little painstaking of my own and Mr. Colson's, a Fellow of the Institute, the Surveyor to the Dean and Chapter of Winchester, who took dimensions specially for these comparisons.

It is somewhat difficult to measure the total length of St. Alban's, and the dimensions taken by the north and south walls vary. The whole of my long dimensions have been taken on the axis of the building with an accurate steel tape in 100 feet lengths.

		ft.	in.	ft.	in.
WINCHESTER ...	From plinth of buttress of east wall of Lady Chapel to plinth of west porch	557	9		
ST. ALBAN'S ...	From plinth of buttress of east wall of Lady Chapel to face of buttress of west porch	550	1¼		
	The extreme length of Winchester Cathedral exceeds that of St. Alban's by	...	...	7	7¾
	Although the extreme length of Winchester Cathedral exceeds that of St. Alban's (with its unfinished porches) by 7 ft. 7¾ in., yet the nave of St. Alban's is 8 ft. 10½ in. longer than that of Winchester.				
ST. ALBAN'S ...	From western face of main west wall to western face of tower	284	5½		
WINCHESTER ...	From western face of main west wall to western face of tower	275	7		
	The extreme length of St. Alban's nave (as seen on the outside) exceeds that of Winchester Cathedral by ...	...	...	8	10½

The nave of St. Alban's is not only the longest in the kingdom but the longest in the world.

This 8 ft. 10½ in. does not fully represent the apparent excess of length of St. Albans—as seen on the outside—beyond Winchester. The aisles of the Winchester transepts take off 25 feet from

the length of the nave aisles. There are no aisles to the transepts of St. Albans. The repetition of the strong unbroken lines of precisely similar length at different levels in the nave and aisles at St. Albans, drives home to the imagination, in a way quite unique, the impression of length.

GENERAL NOTES.

Contrary to the general custom, we find at St. Alban's the architecture on the north side richer than that on the south:—(1). There is evidence of an intention to embellish this portion of the Norman design in the nave;—part of the impost of the triforium arches being carved on the north side, while on the south, there are simply plain stones or tiles.

(2). The transitional arches of the interlacing arcade in the slype, are decorated with a beautiful pattern on the north side; but this has not been carried out on the southern arches.

(3). The north-western porch is much more elaborate than the south-western.

(4). In the nave bays of Trumpyngtone, the north side is richer in detail than the south. It has been suggested that the north side, illumined by the southern suns, would justify additional enrichment. I think however at least in Trumpyngtone's case it was not from local tradition or process of reasoning that this came about, but simply want of money;—which may thus reduce these odd differences to the rank of mere accidents.

Jointing and Bedding.—Many examples were exposed during the restoration of lead dowels in the joints of detached shafts. For instance, one of the shafts in the sanctuary (only $4\frac{1}{2}$ inches diameter), has three dowels in each joint. Sinkings were cut in the upper and lower surfaces of the joints. Holes about one-eighth inch diameter were drilled through the upper stones in each case and melted lead poured in, which, when set, formed the dowel. The shafts were often sunk into both capitals and bases. In some instances, however, the shafts were not let into the capitals, but the same system of dowelling was employed. This system at St. Alban's is more ingenious than that at Westminster Abbey, for at St. Alban's the *dowels only* are lead, but at Westminster a space was left between the capital and the shaft, and by means of one hole (drilled immediately above the necking) lead was poured in, which, when set, formed a collar or bed over the whole surface. This being exposed to the weather, has broken away the neck moulding, but at St. Alban's they are perfect to this day. In the construction of the fourteenth century bays on the south side of the nave *oyster shells* are used with the mortar. In many cases there is a complete bed of shells at the springing of the main arches. The mortar is very hard, and contains much lime.

Sizes of Stones in Tracery.—In two of the Lady Chapel windows on the north side the upper spandrel is filled with tracery, worked in one stone of 3 feet 9 inches by 3 feet 7 inches. This tracery is only 2 inches on face and 8 inches deep. In every instance the tracery in these spandrels has broken through in precisely the same places, owing to the settlement of the window-arch. In the restoration the new cusping has been jointed at the points of failure in the old work. The average size of tracery stones is about 2 feet 6 inches by 2 feet.

STONE—Shrinking of Clunch.—In the ante-chapel wall arcading the new shafts are of clunch stone, and not let into either capitals or bases, but dowelled with slate into both. When fixed, the joints were so tight that the thin blade of a knife could not be inserted, yet within a few months the stone had shrunk $\frac{1}{4}$ inch in circular shafts 3 feet 3 inches long and $3\frac{1}{2}$ inches diameter. In the old work the shafts of like dimensions are mostly in the Barnack stone. Nearly every joint in the arches of the new work (executed in clunch) has shrunk since the time it was fixed. Some laid at one-sixteenth in. thick are now three-sixteenth. These points however do not effect the solidity of the construction.

Perishable Character.—The clunch used in the interior is in wonderfully good preservation, but wherever exposed to the weather it has decayed.

Preference of Hard Stone.—The abaci to the capitals of the ground-story piers of the Early English work are in a stone much harder than the clunch. The architects evidently distrusted the bearing power of the clunch, as in the abaci of the main arches, annulets, strings, &c., at different dates the hard stone was used. I have compared this hard stone, and found it identical with that at Ely, Peterborough, and Bedford, known to be from the Barnack quarries.

Tooling.—The *Norman* stonework is axed.

The *Transition*—chiselled.

The *Early English*—bolster-tooled.

The *Decorated* (including the bays on south of nave and the Lady Chapel) ashlar is claw-tooled —the mouldings scraped.

The *Perpendicular*—finely scraped.

PERIODS OF ARCHITECTURE.

The building may be considered as a huge architectural museum, containing work of almost all dates from the beginning of permanent building in England to the suppression of the Monastery in the sixteenth century.

ROMAN	in part of its materials.
SAXON	in the turned stone balusters.
NORMAN	in the eastern part of the Nave, the Transepts, and the Central Tower.
TRANSITIONAL . . .	in the Slype.
EARLY EARLY ENGLISH	in the western porches.
MIDDLE EARLY ENGLISH	in the western part of the nave, the choir windows, &c.
LATE EARLY ENGLISH .	in the sanctuary.
EARLY DECORATED . .	in the upper parts of the sanctuary, and the sanctuary aisle windows.
MIDDLE DECORATED .	in the ante-chapel.
LATE DECORATED . .	in the lady chapel, the bays on the south side of the nave, and the shrine.
PERPENDICULAR . .	in the screens, north and south windows of transepts, great west window, watching loft, &c.
TUDOR AND SUBSEQUENT STYLES	in the tombs, brasses, stalls, pulpit, &c.

A series extending over a period of about 1,000 years.

These notes have taken up the space and time allowed for my Paper, so that I am compelled to pass over many interesting points. I must for instance omit the general notes on the restoration, which I promised. The notes I have written on this one subject would be material enough for a Paper in themselves.

Probably there is no building in the country which has such peculiar interest for the architect as St. Alban's Abbey. Its antiquity, its vast size, its majestic form, the exquisite proportions of many parts, the wealth of original detail, attracted me first to its study, and my reverence and interest have grown deeper continually as I have laboriously sought after the principles of its designers. An architectural student may well be thankful that good fortune has given him a training by which he may be able to follow through the work of his life in the footsteps of the men of old time. An expression of hearty gratitude to many such old masters in our art is also due from me; especially now to those who at St. Alban's have left for my learning such monuments of their skill and their devotion.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday, the 17th of December, 1877, Mr. Charles Barry, President, in the Chair, the following business took place :—

DISCUSSION ON MR. NEALE'S PAPER—ARCHITECTURAL NOTES ON SAINT ALBAN'S ABBEY.

The President.—I have now to invite discussion on the Paper we have just heard, and I will not detain you with any words of mine. I see a number of gentlemen present who are more able to interest us: but I must call your attention to the fact that whether the Discussion is over or not, we pass on to Mr. Locock Webb's Paper at half past 9 o'clock.

Mr. Ridgway Lloyd, Visitor, said—Mr. President and Gentlemen, it would ill become me to venture to express any opinion of my own upon the purely architectural questions raised by Mr. Neale, but I think I may be permitted to read some extracts from original documents which tend to controvert some of his statements. Mr. Neale ascribes nearly, if not the whole, of the reconstruction of the five decorated bays on the south side of the nave which followed the catastrophe on October 10th, 1323, to Abbot Hugh de Eversdone (1308-1326).

Now it is distinctly stated that to Abbot Michael Mentmore (1335-49) who immediately followed Abbot Richard Walyngforde (himself the successor of Eversdone) was due the construction of the chief portion of the south side of the church, and the completion of two sides of the cloister. In his time the roof was placed over the south aisle newly built. For twenty years this part had been a ruin, owing to various causes, one of them being the Scotch invasion of Northumbria, and the consequent impoverishment of Tynemouth Priory, one of the most important of the cells of St. Alban's Monastery, *Gesta Abbatum*, Vol. II., p. 361. There is confirmatory evidence of this in MS. Nero D. vij, fol. 20 (British Museum), compiled *circa* 1390 by Thomas Walsingham, Precentor. With regard to the statement by Mr. Neale that no example of a feretrum or portable shrine exists in England, I may remark that the Confessor's Shrine at Westminster still retains not only its base, or sub-structure, but also the actual feretrum or theca, enclosing the body of the Saint. At St. Alban's, the base or *tumba*, of Purbeck Marble, is in two distinct passages declared to have been the work of Abbot John de Marinis (1302-8). "He caused the tomb (*tumba*) and feretrum of St. Alban to be moved, whilst decorating it nobly, and expended upon it more than 160 marks." *Gesta Abbatum*, Vol. II., p. 107.

"He caused the tomb and shrine to be removed from the place where it formerly stood, and made the marble tomb which we now see, the cost being eight score marks."—*MS. Nero D. vij.* fol. 19. As a proof of the general trustworthiness of the St. Alban's records, it may be mentioned, that a few weeks ago I met Sir Gilbert Scott in St. Alban's Abbey, and chanced to remark to him

that Abbot J. de Whethamstede during his first Abbacy (1420-40) caused a window to be made in the north country for placing at the west end of the nave.—*J. de Amundisham Annales*, vol. II, p. 198. Sir Gilbert at once examined the stone-work of the window, and pronounced it to be Yorkshire grit.

Sir Edmund Beckett, Bart., Q.C.—Mr. Neale's Paper does not appear to me to contain much that is new or not already published, except his views as to the exact dates of some parts of the Abbey and its contents; and I confess I do not feel much interest in the question whether a given piece of architecture is 50 years older or younger than some other people suppose. I will therefore make one or two remarks on the question of size and length with which the Paper concludes; and I am satisfied from other data that Mr. Neale is right in making Winchester rather longer on the whole than St. Alban's on the fairest comparison; which however is rather difficult to make, as the construction of their west ends is different, and neither cathedral, and especially St. Alban's admits of being measured straight through. From the figures which I had when the list in my Book on Building was compiled, St. Albans appeared rather the longest. There is no doubt that it has the longest nave in the world, even when the nave of Winchester is measured, as I told Mr. Neale it fairly ought to be, not to the western aisle of the transept, which aisle St. Alban's does not possess, but to the internal square of the tower as at St. Alban's. On the other hand I think it fair, now that the lady chapel of St. Albans is restored to the church, to include its area, and that raises the area of the whole church to about 36,720 ft. and therefore puts it above Norwich. I need not say that precision is unattainable in such a matter as the area of churches. It is worth while to notice one or two other points of resemblance and contrast between this and Winchester Cathedral, besides their length and the gradual conversion of the Norman skeleton of both of them into a body of various later dates. In both the choir, I mean the working choir, is carried past the tower; at Winchester into one bay of the nave, at St. Alban's into three; which is more or less the case in several others of the cathedrals which began with the short choirs usual in Norman times whether apsidal or not. The similarity of the enormously high altar screen in these two cathedrals is well known. I can only say that I wish it did not exist at St. Alban's, as it entirely cuts off the view farther east, not only of the low lady chapel but of the three beautiful arches at the proper east end of the choir, which is now much too short. I wish some destroyer had been rather more destructive; and on the other hand that the choir screen called St. Cuthbert's were more complete than it is—if it ever was finished, which seems doubtful, across the south aisle.

Another point for comparison is the tower. And here we are unquestionably very superior to Winchester, whose tower only has one row of windows above the roof, and is obviously defective as an architectural feature of so long a church. Perhaps the Tewkesbury tower, the only other great purely Norman one that I remember, is even better than St. Alban's. It is well known that many Norman towers fell. Their building was generally bad, being composed of mere rubble and often very bad mortar, not comparable to the Roman, or as we see in the remains of Verulanium, which are as hard as possible even where the broken surfaces have been exposed to the weather for ages, while a great deal of the Norman and later Gothic walls of the Abbey is rotten, as we are painfully discovering in the restoration of the south wall of the nave, which has been pushed over about $2\frac{1}{2}$ feet by the roof and the badness of the wall itself, and is now going to be screwed up. I shall be agreeably surprised if a great deal of it is not crushed in the process. The theory, which has been adopted I see, in various late publications, that the leaning of that wall was caused by a failure of the foundations, is found to be entirely without grounds. They are unusually large and good, and not one of the pillars under that leaning wall is out of the perpendicular to any

extent worth meddling with. The whole of the declination practically has taken place above the pillars, obviously from those two causes.

Having slid into talking about the restoration in progress, which is of infinitely more consequence than the history of the building, I may as well say a little on one or two points of general interest. Many persons are naturally anxious for the restoration of the old high pitch of the roof, which undoubtedly is required by its enormous length. But it must be remembered that it would considerably lower the appearance of the tower, which there seems reason to believe once had some kind of spires on the pinnacles, and certainly a wooden, though probably small and later spire of its own, of the same character, I suppose, as sundry other Hertfordshire churches, which I confess are not beautiful. Moreover, unless the roofs of the transepts and choir were raised also, the higher nave roof would look rather incongruous. There are things to be done of much greater consequence than that, to say nothing of the enormous expense of a new roof 210 feet long and about 40 wide.

It is not certain, as Mr. Neale said, whether the western flanking towers were ever finished, though it is clear they were begun. It is considered certain, however, that there were western turrets to the nave, and that from some unknown cause they were in the singular position of not being quite at the end, but 7 or 8 feet short of it; for their staircases are there now; and the Restoration Committee last week ordered them to be restored so as to admit of being carried up as turrets. There can be no doubt that they will be an immense improvement, and that they are absolutely required to harmonise with those which do remain at the ends of all the other and shorter limbs of the church. The peculiar western turrets of Tewkesbury are a grand feature in its outline. They have something of the same character as those at the extremities of the fine west front of Salisbury. But we must not imitate them.

Mr. Neale's drawings illustrate very well the extreme ugliness of the western half of the south aisle, beyond the distance which the cloisters reached, though they were as large as usual, perhaps as large as any cloisters that remain. That wall, I should tell you, is not the original one, but of much later date and of no architectural value whatever, except that it is now much improved by the large new buttresses which are intended to carry internal flying buttresses to the restored wall of the nave. The reason why the predecessor of that wall had no windows was that the abbot's house stood there, with a door into the church. When the wall was rebuilt after falling, with the vaulting of the aisle, the nave was of no use, and it did not signify whether it was dark or light, and they evidently did the work as cheaply as they could, and so they introduced no windows. The legal duty of the Restoration Committee by the faculty appointing them, is to fit the church both for cathedral and parochial use, and I can answer for some of them, at any rate, that we shall not be deterred by any antiquarian fancies from introducing windows there when we think fit, both for the sake of light and to put an end to the frightful ugliness of that blank wall, though the question does not press just yet.

The west front was probably at one time the grandest feature of the church; for that probably was completed by De Cella, whose magnificent inceptions were stopped by want of funds before he had got much farther. If we are ever to restore that, the people of the diocese, or I may say, of all England, must "come forward," as the saying is, to a much greater extent than they have done yet. We have only just enough to rectify the falling wall and restore the adjacent aisle roof, and we shall certainly not venture to meddle with the west front until we see our way to do it thoroughly, and that will be a very costly job. So far as I am concerned I shall certainly do nothing to help it if things of greater practical importance are obstructed. But it is unnecessary to go farther into these questions at present. Whenever Mr. Neale or anyone else reads a Paper expressly

on the restoration question, I hope to be able to discuss it. We have here this evening the successor of the Abbot to whom Mr. Froude has been giving such a shocking character, viz., the Rector of St. Alban's, and perhaps he can contribute something for your information.

The Rev. Walter J. Lawrance, Rector of St. Alban's, Visitor.—I am glad to be able to say with regard to the Paper, that it has been a pleasure to me to afford Mr. Neale every facility in my power in carrying out his work. I congratulate him upon its being so near completion, and I hope it will form a worthy "substructure" or "pedestal" to his future renown. The last seven years I may say have been with me a period of mendicancy, and I can only reiterate the cry of the daughter of the horse leech, "Give, give!" for it does seem rather hard in an age of such increasing luxury and wide-spread opulence, that we should have to call for so long not only upon the diocese, but upon the nation for means, not for decoration or bedizenment, but for the substantial repair of this noble edifice. We have not come near to thinking of Sir Edmund Beckett's windows. We want to do the necessary and substantial work, and I am glad he thinks this most important. When we have enough money for that, we may begin to think about these new windows. We want a great addition to our funds, and I only wish I could see it in this room.

Mr. S. Flint Clarkson, Visitor.—Mr. Neale's careful Paper has dealt at first hand with much discussible matter. I will mention a few points for controversy,—taking them in chronological order. (1.) The existence of an apse in the Norman Church is of course probable, the prototypes of the design being known. Still the only, and not very solid, foundation for that superstructure appears to be the word "Concamerationem" in the *Gesta Abbatum*,—a word that might to all seeming stand equally well for a barrel vault. Some service would be done if instances, in writings of the middle of the 13th century, could be pointed out, where this word is clearly used for the semi-dome of an apse. (2.) Mr. Neale's courage, in disposing of what he has called "the casing theory," might encourage a rash person to hint a doubt, as to the sufficiency of the grounds for believing that the Norman Church extended so far to the westward as the present west-end. There is a strong bias this way, which may be confirmed by discoveries,—but, on the first blush, foundation walls of flint, with courses of tiles in them, would not appear to be below nor beyond the science of the builders of the 13th century. (3.) Much might be added to all that has been said to-night, as to the dominant influence of the Norman structure over the works, which in each succeeding age modified its original forms. The central tower—for instance—has preserved the transepts unaltered in the main. It forced the sanctuary and the sanctuary aisles for at least 50 feet—practically for their whole length—to take their present very special shape, in the 13th century. Probably to the central tower, (or in other words, to the fact that the Norman building was a splendidly proportioned cruciform church) —was due the commencement at the west when—after a century of pause—the great building Abbots began to tamper in earnest with the original design. But it is difficult to go the whole length that Mr. Neale would wish, and to attribute, for instance, the level of the floors in ante-chapel and Lady chapel to the carrying forward of the Norman levels in the Sanctuary Aisles. This seems to be straining after too complete a triumph in every detail. Most probably the eastern arm took, in every part, an additional elevation, bearing relation to that so obvious in the Nave of the sanctuary. (4.) The Saxon Balusters (so called) like those in the Transept, cannot easily be claimed (as by Mr. Neale) for the Sanctuary Triforium also. There are six of them on the east side of the south transept, and only two in the north transept, when six, at least, might have been used there, as in the south. If there were not enough of them to complete the transepts on any system, their appearance in the Sanctuary would be unexpected. (5). John de Cella's floor level in the western portion of the nave has been spoken about in the Paper, with that originality, that spirit of personal enquiry and thinking for

himself, which Mr. Neale has shown throughout. My own idea is that De Cella had no very definite purpose in making the change of floor level. But as plausible conjectures can be put forward, it would evidently be unwise to insist strongly on so elementary a proposition. In addition to Mr. Neale's suggestion, of a wish to increase the amount of internal rise eastwards, there might be mentioned the desire to decrease the external acclivity, in the space westward of the door. Excavations just now in hand may possibly verify the attribution to De Cella of a desire to reach a more solid substratum than that which had probably contributed to the ruin of his first efforts on this spot. Failure from defective foundations seems to have been by no means rare in the building; witness the great crack in the Sanctuary in 1257, and the fall on the south of the nave, of which Mr. Lloyd has spoken, in 1323. Without further multiplying such suggestions, I must pass on to say that the extent to which De Cella intended to carry the lower level eastwards, has apparently been left by Mr. Neale in what may prove to be an ultimate condition of uncertainty. This is a point of much interest just now, when the restoration of this lower floor level is to be made; as part of a radical change in the porches and western front at large, from the ungainly figure maintained since the 16th century. The floor of the western bay of the Nave being lowered, the same lowered floor level—though never before in actual use in the building—will hereafter be an appropriate part of what may be expected to be, in the hands of the architect who has the work in charge, one of the finest of modern ecclesiastical works. (7). One portion of Abbot Trumpyngtone's work away from the west end, in the south transept, furnishes evidence of an itching to meddle more and more with the eastern parts of the church. It might also furnish an admirable test case for any people anxious to contend about principles of restoration. The chapels east of the transept were dark; this transept was much under-lighted; even according to the notions of an earlier time, if we are to judge by the amount of original lighting in the north transept. In the Norman design of the south transept the abutting buildings were allowed to prejudice, to what Trumpyngtone considered a painful extent, the lighting of that great area. He therefore formed the two strange windows in the west wall of the transept. They were probably blocked up again, when the passage over the cloister roof was formed, before the immense south window was inserted and began to pour in —however modified by coloured glass—enormous floods of light. By an odd accident Trumpyngtone's two windows have been reopened at the present time, when the clear glass of the great end windows of the transepts admit an extent of raw light, that would be greatly in excess even if entirely unaided. But time does not allow me to go on further even with this; and therefore of course to enter upon any of the many other points I have noted for remark.

Sir Gilbert Scott.—I rise to propose a vote of thanks to Mr. Neale for his Paper; but, in doing so, I beg that we may not consider this Paper alone. To form an idea of what we have to thank him for, we have to look around us. These walls are hung around with a magnificent exhibition of Mr. Neale's drawings of St. Alban's Abbey, which, be it remembered, are the originals of the illustrations of his work which is forthcoming, and for which I have no doubt he would be glad to obtain additional subscribers.* With regard to the Paper, I will, owing to the shortness of the time allowed, scarcely say anything. There is one thing, however, on which I do not agree with it. That is with regard to the age of the north and south-west portals. My own conviction is that they are both of the same age, and both the work of De Cella. I do not say that he actually *finished* them both, but I confess I cannot trace any difference which indicates difference of age. I have myself taken roughly sections of the mouldings in each, and have since had them more carefully laid

* I have since heard that nearly every copy is subscribed for.

down by measurement; and on placing the tracing of one upon the other, one sees at once that they were not both worked from the same templets; yet they are virtually and to the eye nearly alike, excepting the presence of the dog-tooth in the north portal. In other respects, I cannot say which is the most beautiful; indeed, when one goes from one porch into the other, one cannot remember the difference. They differ, but not in beauty, nor, that I can discover, in age. Both the north and south porches are alike built in continuous courses with the adjoining responds of De Cella's tower arches; and I believe both the porches and the responds [as high as the annulets] to be the undoubted works of De Cella. As to the central Porch, I believe that also to have been mainly De Cella's work, though altered by Trumpyngtone and perhaps by some subsequent persons. Not only the eastern side in which, as Mr. Neale states, the doorways were inserted by Trumpyngtone, and the west side which we all know to have been nearly rebuilt in the fifteenth century, but also the north and south sides are extensively altered from their original design. Mr. Neale limits De Cella's work to the parts below the springing line, but even the highest parts contain mouldings exactly (to the eye) agreeing with De Cella's work.* I beg to propose a vote of thanks to Mr. Neale.

Mr. G. E. STREET, Fellow.—I rise to second, in the shortest possible way, the vote which Sir Gilbert Scott has moved. I have taken a special interest in the work Mr. Neale has done; and the reason why we should all be particularly cordial in returning thanks for this work is the magnificent exhibition of industry and skill he has given us. It is a lesson to all young architects, who too often think they can learn from books what can only be learnt from the study of buildings themselves; and I trust many of the young men present here to-night will see, from what Mr. Neale has done, and the appreciation of his work, that it is to their real advantage to devote themselves to careful original study of the architectural works of which we are justly so proud.

The PRESIDENT.—I am sure I need not do more than ask you to pass this vote with acclamation. This crowded room testifies to the great interest of the subject of the Paper. I, for one, must regret that we did not have the opportunity of reading this Paper a fortnight ago, because, had that been the case, no doubt views of those here well calculated to give them to us upon it, would have been expressed to-night. We have, however, had some instructive remarks, but outside the subject. I could not help, when I heard of the north arches of the nave of St. Alban's Abbey tumbling down and the southern wall requiring to be screwed up, reflecting that this occurred with the works of architects in the thirteenth and fourteenth centuries, to remedy which disasters we are now asked to subscribe money, and then unavoidably I could not help further speculating what would be the effect upon ourselves if the arches of our works tumbled down and their walls required to be screwed into perpendicularity. I cannot but think there would soon be an end to our practice as architects altogether.

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* As regards Trumpyngtone's bays in the nave, I would suggest the question whether the shafts, existing or prepared for in some bays but not in others, were really intended as *vaulting* shafts. They may have been only intended as the architectural supports of the timber roof, like those at Whitby and so many other unvaulted churches. The fine "Decorated" bays must I think be the work or design of Eversdone's architect as high up as the triforium string; though, even in this stage, the arms of France occur, which would point to a later date had it not been that they may have been carved or inserted subsequently. The rest may probably be the work of Mentmore, who is also recorded to have vaulted the aisle. The intermediate Abbot (Wallingford) is known to have neglected the work.

The date of the substructure of the shrine of St. Alban is a very interesting question. I agree with Mr. Neale that its style looks too late for the time of De Marynes (1302-8). I fancy De Marynes only commenced the work, but that it must have been mainly carried out by his successor, with whose style it seems to me to agree. The top slab must, I think, be of earlier date; as its carving is "Early English." The "restoration" question having been nominally excluded, but still having been alluded to in the course of discussion, I beg that my silence may not be interpreted as giving consent to what was said,—on which I desire to reserve my opinion.

The vote of thanks was unanimously agreed to.

Mr. NEALE.—In the first place, I beg to thank you for the vote you have kindly passed. I should also like especially to thank Sir Edmund Beckett and Sir Gilbert Scott for their criticisms. I must, however, claim one thing for myself, modestly—that the matter of this Paper is entirely original. If it be not, as Sir Edmund suggests, I should be pleased to be informed where it has previously appeared. As for talking about the restoration, I am afraid that subject is one of so much interest that it would take a great deal more time to enter on than is now available, and still more to discuss. One word with regard to the mouldings of the western porches: I have taken real size copies of the details of all the porches; and by doing this, I discovered the variety in their form, and decided change of character. The courses of masonry do partly range, but not thoroughly. The record respecting the west window was pointed out to me some two years since by the Rev. H. Fowler. I then examined the stone, and found it was not Clunch. With regard to the west front, the turrets, and the proposed new windows, I have a good deal to say; but not to-night. I will conclude by thanking most earnestly in the first place Mr. Street, because it was some years ago, whilst in his office, I was encouraged in my love and reverence of old buildings, and taught to measure accurately old work; and I am also much indebted to Sir Gilbert Scott and the Rev. W. J. Lawrance, from whom I have had every facility and assistance on the building, without which I could not have accomplished my work.*

The Discussion on this subject having been brought to a close, the President invited Mr. Locock Webb, Q.C., to read his Paper on "The Law of Easements," *(for which see next page).*

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* I feel compelled to make good omissions in my reply, caused by my anxiety to be as brief as possible. To reply fully to all the points raised by Mr. Lloyd and Mr. Clarkson, it would have been necessary that I should have re-opened the question at considerable length. I ought not however to have omitted to thank them both, not only for calling attention to important points at the Meeting, of which I have much to say hereafter, but also for help at other times. I may confess that to Mr. Clarkson's unsparing criticism, always and for a long time at my service, is due some of the spirit of radical inquiry and of original research which I had hoped and still hope—notwithstanding Sir E Beckett's sweeping imputation of mere copyism—that all who know the Abbey thoroughly will find in almost every line of my Paper.—J. NEALE.

ON THE LAW OF EASEMENTS.

By Locock Webb, Q.C., Honorary Associate.

Introduction.

Mr. President and Gentlemen,—In the very able and eloquent Address with which the present Session of the Royal Institute of British Architects was opened, you, Sir, whilst assuring the class of Honorary Associates, which the Institute has recently founded, "a most cordial reception within these walls," intimated that their ideas would receive consideration. I beg, Mr. President and Gentlemen, that I may be permitted to avail myself of this opportunity to offer my best thanks to this Institute for the honour conferred upon me by my election as one of its Honorary Associates, and at the same time to say that I highly appreciate the invitation which has been conveyed to me to prepare a Paper to be read at one of its Meetings. I have selected for my subject the Law of Easements, because it occurred to me that it was a branch of the law, in particular, which might be usefully discussed; but whether I have exercised a wise selection or not, I am sure that I may rely upon that "cordial reception and consideration" which you, Sir, were good enough to promise to Honorary Associates.

Definition of Easements.

"An easement," writes the learned author of *Gale on Easements*, "may be defined to be, a privilege without profit, which the owner of one neighbouring tenement hath of another, existing in respect of their several tenements, by which the servient owner is obliged *to suffer or not to do* something on his own land for the advantage of the dominant owner." This definition was adopted by the Court of Exchequer in *Mounsey* v. *Ismay*. The term "servitude" is used to express both the right of the dominant and the obligation of the servient tenement; the term "easement" generally expresses the right only.

Essential Qualities and Acquisition of Easements.

There must as an essential quality of an easement be two distinct tenements; the dominant, to which the right belongs, and the servient upon which the obligation is imposed. The right conferred by an easement attaches upon the soil of the servient tenement. If any disturbance of an easement has taken place previous to the transfer of the servient heritage, although such tortuous act would give a right of action against the former owner, his successor is also liable if he allows it to continue. The servitude, when once acquired, passes with the heritage into the hands of each successive owner. Although the right to an easement is a "privilege without profit," it has been held that an easement is an interest in land for the invasion of which compensation may be claimed under "The Lands' Clauses Consolidation Act, 1845," (28 and 29 Vict. c. 18), as, for instance, in *Reg.* v. *The Great Northern Railway Company*, where the Company obstructed the plaintiff's access to a ferry which was appurtenant to his house, and in *Glover* v. *North Staffordshire Railway Company*, where the Company obstructed the plaintiff's private way appurtenant to his farm.

Easements are either affirmative or negative. Affirmative easements authorise the commission by one owner of acts which, in their inception, are positively injurious to another; such, for example, as a right of way over, and a right to discharge water by a spout or projecting eaves, upon another man's land, the right to support from a neighbouring wall, the right to use or to affect water of a natural stream in any manner not justified by natural right. Negative easements are injurious consequentially only, restricting the owner of the soil in the exercise of his natural rights of property; as where he is prevented building on his own land to the obstruction of lights. The right of support of neighbouring soil for land *not incumbered by buildings*, and the right of a riparian owner to the flow of a stream in its natural course, are ordinary incidents of property, and not easements.

The origin of every easement may be referred to an agreement, either express or implied, of an owner of the property to be subjected to it. In the case of express agreement, it will be obvious that the precise words of the instrument itself must determine the extent of the right created. Easements in general bear a strong resemblance to covenants running with the land, both express and implied. Thus, when the dominant tenement itself is conveyed, whether in fee or for any less estate, all rights which the conveying party enjoyed by virtue of and as appendant to his estate as against third parties pass with it.

Easements by Implied Grants.

The implication of the grant of an easement may arise in two ways: firstly, upon the severance of a heritage by its owner into two or more parts; and, secondly, by prescription.

Upon the severance of a heritage, a grant will be implied of all those continuous and apparent easements which have been used by the owner, and which are necessary for the use of the tenement conveyed, though they had no legal existence as easements, and of all those easements without which the enjoyment of the severed portions could not be had at all. In the leading case of *Palmer* v. *Fletcher*, decided in the time of Elizabeth, the Rule of Law was laid down thus: If A. builds a house on part of his own land, and afterwards sells the house to B. and the land adjoining to C., who obstructs the lights, although the house be a new messuage, yet a person who claims the land by purchase from the builder cannot obstruct the lights any more than the builder himself, who could not derogate from his own grant, for the lights are a necessary and essential part of the house. Lord Chief Justice Tindal in *Swansborough* v. *Coventry*, said: "It is well established by decided cases," (referring to *Palmer* v. *Fletcher* and subsequent authorities), "that where the same person possesses a house having the actual use and enjoyment of certain lights, and also possesses the adjoining land, and sells the house to another person, although the lights be new he cannot, nor can any one who claims under him, build upon the adjoining land so as to obstruct or interrupt the enjoyment of those lights;" and in *Riviere* v. *Bower*, Lord Tenterden held that an action was maintainable against a possessor holding as tenant for the obstruction to a window existing in the landlord's house at the time of the demise, although of recent construction, and that although there was no stipulation at the time of the demise against the obstruction.

Grants will be construed most strongly against the grantor, for "no principle can be more sacred" (as was observed by the Master of the Rolls in *Leech* v. *Schweder*) "than that a man shall be compelled to perform his contract:" and another kindred principle is, that "no man shall derogate from his own grant." Both these doctrines are well established Rules of Law. Let me give but a single example of their application from one of the "golden legacies" of Vice-Chancellor Sir R. T. Kindersley. In *Davis* v. *Marshall*, F. had demised a tenement, "together with all the ancient lights, and areas, and appurtenances;" at the date of the demise the tenement had also *new lights*, and the

learned Judge held that all the appurtenances which existed at the time when the lease was granted were as much the subject of the lease as the ancient lights, and that F. would not have been entitled to block up those new lights any more than he could have blocked up the ancient lights, and that, if F. could not do so, neither could any person do so who derived title from him subsequently to the grant of the lease.

Upon the severance of an estate, such rights of easements, usually called "*easements of necessity*," will be acquired by implied grant as may be necessary to give effect to the intention of the parties to the severance. For instance: if I have a field enclosed by my own land on all sides, and I alien this close to another, he shall have a way to this close over my land as incident to the grant; for, otherwise, he cannot have any benefit by the grant. So also, on the same principle, if a man grants to another the minerals under his lands, the grantee would, as incident to the grant, have the right to execute the necessary works to win the minerals, including the right to fix machinery to drain the mine. And if a man sells trees in his wood, that implies liberty to take them away. The grant of a thing passes everything included therein, without which the thing granted could not be had. This rule is well illustrated by *Watts* v. *Kelson*, where the owner of properties A and B, in 1860, made a drain from a tank on property B to a lower tank on the same property, and laid pipes from the lower tank to cattle sheds on property A, for the purpose of supplying them with water, and they were so supplied till 1863, when the owner conveyed property A, "together with all waters, watercourses, &c., to the same hereditaments and premises belonging or appertaining, or with the same, or any part thereof, held, used, enjoyed or reputed as part thereof, or appurtenant thereto," unto the plaintiff, who afterwards erected cottages in place of the cattle sheds. The plaintiff had the use of the water after his conveyance until the defendant, a subsequent purchaser of property B, stopped it: and it was determined that the watercourse was a continuous easement necessary for the use of property A, and would have passed by implication; the plaintiff was entitled to the use of the water on the conveyance of that property without any words of grant, and, supposing it only convenient and not necessary, the general words were sufficient to pass it; and further, that the right was to have the accustomed flow of water through the pipes, without regard to the purpose for which the plaintiff used it, and the right was not lost by his erecting cottages instead of cattle sheds. In the recent authority of *Kaye* v. *Oxley*, the principles laid down in *Watts* v. *Kelson* were fully upheld.

But a grant arising out of the implication of necessity cannot be carried further than the necessity of the case requires; if for example, a way is claimed by necessity, there must be a necessity continuing up to the time of the trespass justified under it, and it is a good answer to show that there is another way which the party may use. Again there must be a reasonable user of the easement. "When," said Lord Chief Justice Bovill, in *Williams* v. *James*, "a right of way to a piece of land is proved, then, that is, unless something appears to the contrary, a right of way for all purposes according to the ordinary and reasonable use to which that land might be applied at the time of the supposed grant. Such a right cannot be increased so as to affect the servient tenement by imposing upon it any additional burthen. It is also clear, according to the authorities, that where a person has a right of way over one piece of land to another piece of land, he can only use such right in order to reach the latter place. He cannot use it for the purpose of going elsewhere;" and in the same case Mr. Justice Willes added, "In the absence of any clear indication of the intention of the parties, the maxim that a grant must be construed most strongly against the grantor must be applied."

So in *Thorpe* v. *Brumfitt*, one having the right to use a passage leading to an inn yard for the purpose of loading goods from his warehouse, was not permitted to occupy the passage by stationary

obstructions when any other person having a right of way required to pass. And in the recent case of *Wood* v. *Saunders*, the principle was applied, that where an easement to land has been granted, the use of that easement will be restricted to a *reasonable use*, for the purpose of the land in the condition in which it was when the grant was made. In that case, A was the grantee of a mansion, and of an easement for the discharge of sewage from it into a cesspool on his neighbour's land, and after the date of the grant, he greatly enlarged the mansion and converted it into a lunatic asylum, which was drained into the cesspool, causing a serious nuisance; and an injunction was granted, restraining A from allowing the drainage from the additional buildings to go into the cesspool.

Easements by Prescription.

Easements are also acquired by *prescription*, or in other words by possession had during the time and in manner fixed by law, for after the lapse of the requisite period, the law adds the right of property to that which before was possessory only. To constitute a legal possession, there must be not only a corporeal detention, or that quasi-detention, which, according to the nature of the right, is equivalent to it, but there must be also the intention to act as owner. An enjoyment in order to confer a title must have been uninterrupted, both as to the manner and during the time required by law; but in those easements which require the repeated acts of man for their enjoyment, as rights of way, it would appear to be sufficient if the user is of such a nature, and takes place at such intervals as to afford an indication to the owner of the servient tenement, that a right is claimed against him—an indication that would not be afforded by a mere accidental or occasional exercise of it.

By the 2 and 3 Wm. IV. c. 71 (1832), commonly known as "The Prescription Act," the title by prescription is governed by statutory provisions, making the length of possession prescribed by the statute a bar or title of itself, which was so before only by the intervention of a jury. The Act provides that (§ 1) claims to right of common and other rights with profit shall not be defeated after thirty years uninterrupted enjoyment, unless held by consent or agreement; (§ 2), the prescription in respect of rights of way or other easements shall be twenty years; (§ 3), "when the access and use of lights to and for any dwelling-house, workshop or other building, shall have been actually enjoyed therewith for the full period of twenty years without interruption, the right thereto shall be deemed absolute and indefeasible, any local usage or custom to the contrary notwithstanding, unless it shall appear that the same was enjoyed by some consent or agreement, expressly made or given for that purpose by deed or writing," and that (§ 4), each of the before-mentioned periods shall be deemed to be those next before some suit or action, wherein a claim to which such periods relate shall be brought into question.

A custom formerly prevailed in the City of London that a man might build to any height on his old foundations, although he obstructed his neighbours' ancient lights; and the like custom also existed, I believe, in the City of York, and other towns, but in *The Salter's Company* v. *Jay*, and *Truscott* v. *The Merchant Taylor's Company*, it was decided that all such customs were abolished by the Prescription Act. One object of the Act was to shorten the time by which persons who had the access and use of light could acquire an absolute right to it. In order that the enjoyment which the quasi-possession of an easement may confer a right to it by length of time, it must have been open, peaceable, and "as of right." Referring to the Prescription Act, Vice-Chancellor Malins observed, in *Lanfranchi* v. *Mackenzie*, "The cases since that statute have proceeded upon the same principle as before; namely, that in order to establish the right you must shew that there has been an undisturbed peaceable enjoyment."

Particular Easements.

Having noticed the general principles relating to the law of Easements, I propose to allude to some particular easements and natural rights of a similar character, such as those relating to running water, eaves, subterraneous channels, nuisances, and light and air.

Running Water is the subject of easements of several kinds. The right to receive a flow of water in a natural stream and transmit it into its accustomed course is an ordinary right of property—a natural right. The right to interfere with the accustomed course of the stream, by penning it back upon the land above or transmitting it, altered in quality or quantity to an extent not justified by natural right, is an easement. Without any convention, the occupier of a lower field holds it under servitude of recovering the natural drainage from an adjoining field on a natural level. This servitude is imposed by usage, depending upon natural situation, and extends to usual floods. But, if a storm floods the adjoining lands in an unusual manner, the land-owner may, it seems, fence against it, within the period of prescription. He may raise the banks to keep the stream within its ancient bed, if he can do so without injury to others, and so perhaps if the stream changes its course. "The right to the use of water," said Sir J. Leach, in *Wright* v. *Howard*, "rests upon clear and settled principles: *prima facie* the proprietor of each bank of a stream is the proprietor of half the land covered by the stream, but there is no property in the water. Every proprietor has an equal right to use the water which flows in the stream, and consequently no proprietor can have the right to use the water to the prejudice of any other proprietor." Easements of an affirmative nature, the object of which is to interfere with the natural course of the stream, may be acquired by user over a stream flowing through a man's own land, or through his neighbour's land.

With regard to *eaves*, although everyone in building is bound to construct his house so as not to overhang his neighbour's property, and to construct his roof in such a manner as not to throw the rain water upon the neighbouring land, yet it would seem that a man may acquire a right by user to project his wall or eaves over the boundary line of his property, or to discharge the rain running from the roof of his house upon the adjoining land.

As to Subterraneous Channels, the rule of law which governs the enjoyment of a stream in its natural course is not applicable to underground springs or subterraneous channels. In *Chasemore* v. *Richards*, which was decided by the House of Lords, the plaintiff was possessed of an ancient mill, about a mile from Croydon, which for upwards of sixty years had been worked by the flow of the River Wandle. The river was supplied with water produced by the rainfall on a very extensive district, large quantities of which sank into the upper ground to various depths, and then flowed and percolated through the strata towards and into the river. The Local Board, for the purpose of supplying Croydon with water, sank a large well, to a considerable depth, in their own ground, and pumped therefrom between 500,000 and 600,000 gallons of water daily; and by such means the ordinary underground percolation of water was diverted from the river to such an extent that the mill-owner lost the use of the stream, and sustained material damage; but it was held that this gave the mill-owner no right of action against the Board. It would seem that the law permits any person to dig wells or cut drains in his own lands with impunity, although he thereby drains his neighbour's land, by interrupting the flow of water percolating through the pores of the soil, and which, but for such cutting or draining, would have reached his neighbour's land, or by causing the water already collected on his neighbour's soil to percolate away from and out of it. But on the other hand, if A makes a grant of land to B without any exception of the rights to the streams of water in the land, neither A nor anyone claiming under him could, it is conceived, lawfully do anything which would

have the effect of draining the underground water or diverting any stream from the land, for such an act would operate as a derogation from A's grant.

The easements acquired and servitudes imposed by an *artificial watercourse* depend on the purpose for which it has been made and used. Thus, in the recent case of *Taylor* v. *The Corporation of St. Helens*, it was held by the Court of Appeal (affirming the decision of the Vice-Chancellor of the Lancaster Court), that the grant of an artificial channel of the definite springs and streams on land, and of such other water as should find its way into and run down the channel as it stood, did not operate as a grant of all the water on the land, and that the grantors had no right to alter the levels of or enlarge the channel, so as to enable it to carry off all the water that ran into it in times of heavy rain.

Sewers.—In a certain sense all sewers passing through the lands of private owners are easements; but sewers constructed under legislative authority, or which, although originally private property, have become vested in public bodies, such as the Commissioners of Sewers, are regulated by statutory authority. Commissioners of Sewers were originally established under the provisions of the 23 Hen. VIII. c. 5, commonly called "the Statute of Sewers," which was made perpetual by the 3rd and 4th Edw. VI., c. 8. By the "Land Drainage Act, 1861" (24 and 25 Vict. c. 133), the powers of Commissioners of Sewers extend (§ 1) to cleansing, repairing, or otherwise maintaining in a due state of efficiency, any existing watercourse or outfall of water, or any existing wall or other defence against water, and (§ 2) to deepening, widening and straightening such watercourses. By the interpretation clause "watercourse" includes all rivers, streams, drains, sewers and passages through which water flows.

The law relating to *Sewerage* is regulated by the Public Health Acts of the 31 and 32 Vict. c. 115 (the Sanitary Act, 1866), and the 38 and 39 Vict. c. 55 (the Public Health Act, 1875), which repealed the 31 and 32 Vict. c. 115, except so far as relates to the Metropolis. Under the provisions of the Act of 1875, all existing and future sewers, within the district of the local authority, except sewers made by any person for his own profit, or by any company for the profit of the shareholders, and sewers made and used for the purpose of draining, preserving or improving land under any local or private Act of Parliament, or for the purpose of irrigating land and sewers under the authority of any Commissioners of Sewers, are vested in and placed under the control of the local authority; which is restricted from making or using any sewer, drain, or outfall for the purpose of conveying sewage or filthy water into any natural stream or watercourse, or into any canal, pond or lake, until such sewage or filthy water is freed from all excrementitious or other foul or noxious matter, such as would affect or deteriorate the purity and quality of the water in such stream or watercourse, or in such pond or lake.

Nuisances.—The term "nuisance" is applied in the law indiscriminately, both to a disturbance of an easement already acquired, and infringements upon the natural rights of property, for which an action can be sustained. Strictly speaking, however, the term nuisance should be confined to the latter class of injuries only; those acts which though originally tortuous as infringing the common law rights of property, may nevertheless, in process of time, confer a prescriptive title by enjoyment. Many acts done upon a man's property which are in their nature injurious to the adjoining lands, and consequently actionable as nuisances, may be legalized by prescription. There can, however, be no prescription to make a common nuisance, which is a prejudice to all people, because it cannot have a lawful beginning by licence, or otherwise being against the common law. But when manufactories have been borne with in a neighbourhood for many years, it may operate as a consent of the inhabitants to their being carried on, though the law might have considered them as nuisances had they objected to them in time.

Subject, of course, to any statutory regulation, a manufacturer may consequently acquire a right to pour polluted water into a stream, so that those below him, coming after he has acquired the right, may not be entitled to complain. In the *St. Helens Smelting Company* v. *Tipping*, decided by the House of Lords, it was held that, unless by a prescriptive right, every man must use his own property as not to injure that of his neighbours, but that the law did not regard trifling inconveniences; everything must be looked at from a reasonable point of view, and, therefore, in the case of an alleged injury to property, as from noxious vapours from a manufactory, the injury to be actionable must be such as visibly to diminish the value of the property; that the locality and all other circumstances must be taken into consideration, and that in counties where great works have been carried on parties must not stand on extreme rights. Again in the *Attorney General* v. *Sheffield Gas Consumers Company*, an injunction was refused because the injury, which consisted of hindrance to traffic from the taking up of parts of streets by a private gas company, was neither serious nor continuous; and in *Cooke* v. *Forbes* an injunction was refused because the injury done was accidental and occasional only.

As to Light and Air.—The strict right of property entitles the owner to so much light and air only as fall perpendicularly on his land. He may build to the very extremity of his land and no action can be maintained against him for disturbing his neighbour's privacy by opening windows which overlook the adjoining property; but it is competent for such neighbour to obstruct the windows so opened by building against them on his own land at any time during twenty years after their construction, and thus prevent the acquisition of the easement. The right to the reception of light and air in a lateral direction without obstruction is an easement.

The right to the enjoyment of *air* is generally speaking governed by the same principles as those which regulate the passage of light. About the year 1614 a singular case of an easement of this kind is reported, from which it would appear that where one erected a house so high that the wind was stopped from the windmills in Finsbury Fields, it was adjudged that it should be broken down; but there were probably some special circumstances connected with that case—the house may have been built contrary to some privilege conferred on the windmill, both the house and the windmill being on the estate of the prebend of Finsbury. Besides, at that time it was the practice of the Crown to prohibit and regulate buildings in the neighbourhood of London by proclamation; and the house may have been built in defiance of the proclamation, and the owner of the windmill may have sued for the injury he sustained by the building which either was, or was supposed to be, illegal. There are several other cases in the old law books of complaints arising from injury by stoppage of windmills by buildings, showing that relief was granted on the ground that the buildings were *nuisances*; but all those decisions may probably be explained on some such grounds as those relating to the Finsbury Windmill.

It is rarely now that a case is established for the interference of the Court upon the ground of stoppage of air irrespective of obstruction to light; but in my own experience such cases have arisen. For example, in *Kidd* v. *Wagner*, heard before the Master of the Rolls, where the complaint was that the defendant intended to build a new church in Brighton, so close, and of such a height, as to stop the free passage of light and air to the plaintiff's malthouse which required a free current of air, a perpetual injunction was obtained; and in *Dickey* v. *Pfeil*, heard in the last vacation before Mr. Justice Fry, where the complaint was mainly grounded on the stoppage of the free current of air to the plaintiff's houses situated in the crowded neighbourhood of Drury Lane, an *interim* injunction was granted; but such instances are exceptional, and in the following observations no distinction is intended to be drawn between the obstruction of light and air, although mention is made to the obstruction of light only.

With regard to the law relating to the obstruction of ancient lights, the old doctrine which was established by Lord Eldon, in what has been termed "the parent case," of *The Attorney General* v. *Nichol*, seems in substance never to have been departed from. "There are," said his Lordship, "many obvious cases of new buildings darkening those opposite to them, but not in such a degree that an injunction could be maintained, or an action upon the case which however might be maintained in many cases, would not support an injunction." In that case an injunction was dissolved upon an undertaking on the part of the defendant if the verdict upon the trial promptly had should be against him, to remove such of the buildings complained of as should be proved in a material and improper degree to affect the plaintiff's ancient lights.

It was held also in the leading case of *Back* v. *Stacey*, that in order to give a right of action and sustain the issue, there must be a substantial privation of light sufficient to render the occupation of the house uncomfortable, *and* to prevent the plaintiff from carrying on his accustomed business on the premises as he had formerly done. With the single exception of reading *or* for *and*, I apprehend that *Back* v. *Stacey* correctly lays down the doctrine in the manner in which it would now be supported in an action in the Supreme Court of Judicature.

Lord Cranworth made some observations in *Clark* v. *Clarke*, which were originally supposed to imply that there was some difference between the right of a person residing in a town and the right of a person residing in the country to be protected in respect of obstruction of ancient lights. But soon after that case his Lordship's own decision in *Yates* v. *Jack*, dispelled any such idea, and laid down the rule that the owner of ancient lights was entitled not only to sufficient light for the purpose of his then business, but to all the light which he had enjoyed previously to the interruption sought to be restrained. In *Dent* v. *The Auction Mart Company*, Lord Hatherley (then Vice-Chancellor) reviewing the state of the law relating to ancient lights, referred with approbation to the parent case of *The Attorney-General* v. *Nichol*, and to *Back* v. *Stacey* and *Yates* v. *Jack*. "The principle," said his Lordship, "on which the Court interferes in these cases is somewhat analogous, as far as value can be compared with comfort, to the case of specific performance where the Court says it is not enough to pay a man a sum of money, he is entitled to have the specific property which he has acquired and to be relieved against the breach of the contract. In all these cases the questions are, first, whether damages would be recoverable, and secondly, whether the damages, if recovered, would be such as to authorise the Court to interfere."

In *Tapling* v. *Jones*, which was decided by the house of Lords about a year before Lord Hatherley's judgment in *Dent* v. *The Auction Mart Company*, Lord Westbury said, "The right to what is called an ancient light now depends upon positive enactment" (referring to the Prescription Act). "It is a matter *juris positivi*. Written consent or agreement may be used for the purpose of accounting for the enjoyment of the servitude, and thereby preventing the title which would otherwise arise from uninterrupted user or possession during the requisite period. After an enjoyment of an access of light for twenty years without interruption, the right is declared by the Statute to be absolute and indefeasible, and it would seem, therefore, that it cannot be lost or defeated by a subsequent temporary intermission of enjoyment. Moreover this absolute and indefeasible right, which is the creation of the Statute, is not subject to any condition or qualification; nor is it made liable to be affected or prejudiced by any attempt to extend the access or use of light beyond that which, having been enjoyed uninterrupted during the required period, is declared to be not liable to be defeated." And Lord Cranworth added, "The plain principle seems to me to be that no one can interfere with the absolute and indefeasible right of another unless where such interference is made necessary by the wrongful act of the party possessing the right." The rule was also thus

tersely put by Lord Chelmsford, "By the Prescription Act, after twenty years user of lights the owner of them acquires an absolute and indefeasible right, which so far restricts the adjoining owner in the use of his property that he can do nothing upon his premises which may have the effect of obstructing them." *Straight* v. *Burn* decided that the doctrine of *Tapling* v. *Jones* applied to equitable as well as to legal rights.

Dent v. *The Auction Mart Company* was followed by *Martin* v. *Headon*, in which Vice-Chancellor Kindersley expressly laid down the rule that there was no distinction between the right to light and air in regard to town houses and country houses. "The right," said that learned Judge, "conferred or recognized by the Statute 2 & 3 Wm. IV. c. 71, is an absolute indefeasible right to the enjoyment of the light without reference to the purpose for which it has been used. Therefore, even if the evidence satisfied me, which it does not, that for the purpose of their present business a strong light is not necessary, and the plaintiffs will still have sufficient light remaining, I should not think the defendant had established his defence unless he had shown that for whatever purpose the plaintiff might wish to employ the light, there would be no material interference with it."

The easement of the owner of a dominant tenement to have his light and air unobstructed is not lost or diminished by the circumstance that he has himself contributed to the diminution of light as in *Straight* v. *Burn;* or that by means of clearances effected in the neighbourhood by other parties, he acquired more lights than the buildings could obstruct. "The right," said Lord Justice James (then Vice-Chancellor) in *The Dyers' Company* v. *King*, "is a right as between the owner of the dominant tenement and the owner of every servient tenement, and he has a right to as much light to and for the use of his house over his neighbour's land as he enjoyed twenty years ago, and the neighbour has no right to deprive him of the light which has so come to and for the use of the house over the neighbour's land because the owner of the dominant tenement has either by purchase from, or by the free gift of any other person, or by the operation of any Act of Parliament, obtained other light in addition to that which he had a prescriptive right to."

The Prescription Act has not altered the law as to the nature and extent of light to which the owner of an ancient light is entitled. "The nature and extent of the right before that statute" (citing from the judgment of the Lord Justice James, in *Kelk* v. *Pearson*), "was to have that amount of light through the windows of a house, which was sufficient, according to the ordinary notions of mankind, for the comfortable use and enjoyment of that house as a dwelling-house if it were a dwelling-house, or for the beneficial use and occupation of the house if it were a warehouse, a shop, or other place of business. That was the extent of the easement—a right to prevent your neighbour from building upon his land so as to obstruct the access of sufficient light and air to such an extent as to render the house substantially less comfortable and enjoyable." In the same case Lord Justice Mellish said: "The right to light and air at the present time by no means depends exclusively upon the statute. A right to light and air may be gained, and in many instances is gained, by implied grants from persons who were the owners of houses upon lands adjoining. Before a house had been erected twenty years, or even if it had been erected twenty years, no light could be gained so long as the land on which any obstruction could be placed was the property of the same owner; but it is perfectly settled that if the owner of a house sell land on which an obstruction might be erected, or sell the house and reserve to himself the land on which the obstruction may be erected, the right to light and air is gained by implied grant from what is called the disposition of the owner of the two tenements." Lord Selborne, in *The City of London Brewery Company* v. *Tenant*, expressed his complete adherence to the view of the law taken in *Kelk* v. *Pearson*.

The decision in *Leech* v. *Schweder* did not differ from the doctrine laid down in *Kelk* v. *Pearson*. The simple facts in *Leech* v. *Schweder* were these :—L. was the assignee of the lease of a tenement in the City of London, used as a manufactory and warehouse, "with all lights, easements, advantages, and appurtenances whatsoever thereto belonging or in anywise appertaining." The lease contained a covenant for quiet possession. S. claiming under the same lessors, proceeded to erect a new building, and in doing so raised the party wall about fifteen feet above its original height, and according to his plans, it appeared that he intended to raise the wall to the height of about fifteen feet more. Lord Selborne (sitting for the M. R.), upon an interlocutory application, restrained S. from proceeding with the building till the hearing of the cause. At the hearing, Sir George Jessel (M.R.) granted a perpetual injunction, substantially in the words of the covenant; and, in delivering judgment, said :—"It is clearly established by authority that there is sufficient to justify the Court interfering if there has been a breach of the covenant. It is not for the Court, but the plaintiffs, to estimate the amount of damage that arises from the injury inflicted upon them."

Upon appeal the Lords Justices held that there was no difference in the right of an owner of land to the ordinary easement of light, whether it was acquired by twenty years' user or by grant from the owner of the servient tenement, and if the grant was accompanied by a covenant for quiet enjoyment of the premises, such covenant did not enlarge the right of the covenantee so as to entitle him to an injunction to restrain an obstruction where the damage was not sufficient to enable him to maintain an action at law. But it was otherwise where the right to light claimed was not the ordinary easement, but a special right created by the covenant, in which case a Court of Equity would grant an injunction without regard to the amount of damage. S. had by his answer denied that the wall materially obstructed the light to L.'s premises, and claimed the right of erecting it as high as he pleased; but on the appeal he offered not to erect the wall beyond a certain height, then indicated, and their Lordships directed a temporary screen to be erected, and appointed a surveyor to report on its effect.

It is material to observe that before the bill in *Leech* v. *Schweder* was filed, the wall had been already raised about fifteen feet above the height of the original wall, and that on the hearing of the appeal the defendant abandoned the right which he had previously insisted upon, and offered not to increase the height beyond a point indicated, which, it was alleged, would not materially obstruct the plaintiffs' lights. I have always understood (and it devolved upon me to draw the bill, and to be engaged in that case throughout) that the sole difference between the Court below and the Court of Appeal—most important no doubt as it is—was simply this: the Master of the Rolls held that upon the contract "he must decide whether there was any molestation or disturbance at all," and the Lords Justices held that a covenant for quiet enjoyment accompanying a grant of lights conveys no greater or other right in equity than the covenantee would have at law, and consequently unless you can show that the right you claim falls within the terms of the demise you cannot succeed on the covenant.

The law relating to ancient lights was again reviewed by the Master of the Rolls in *Aynsley* v. *Glover*: "As I understand," said his Lordship in that case, "the rule now is, and I shall so decide in future—unless in the meantime the Appeal Court shall decide differently—that, whenever an action can be maintained at law, and really substantial damages, or, perhaps I should say considerable damages (for some people may say that £20. is substantial damages) can be recovered at law, then the injunction ought to follow in equity; generally, not universally, because I have something to add upon that subject," and further on his Lordship added, "if I had found by the evidence that there was in this case a clear instance of very slight damage to the plaintiff—that is, some £20. or £30.,

or £40., but still very slight, and a very large material substantial damage to the defendant, I should be disposed to hold that that was a case in which this Court would decline to interfere by injunction, having regard to the new power conferred upon me by Lord Cairns' Act to substitute damage for it." And in the still more recent case of *Kino* v. *Rudkin*, it was decided by Mr. Justice Fry that, since the Judicature Act, as before it, a plaintiff in an action to restrain an alleged obstruction to ancient lights cannot obtain an injunction unless he proves substantial damage. In *Kino* v. *Rudkin* the further very important rule was laid down: that an inquiry as to damages will not be directed where the plaintiff has opened a case of substantial damages and has failed to prove it.

It is impossible to lay down any rule as to what would constitute sufficient damage upon which to ground an application. But the result of the authorities may be I think shortly stated thus:—It is not every impediment to the access of light or air which will warrant the interference of the Court by way of injunction, or even entitle the party alleging himself to be injured, to damages. In order to found a title to relief in respect of such an impediment some material or substantial injury must be established, and the onus of proving the injury rests upon the plaintiff.

As to the Angle of 45 Degrees.

It may be useful, however, to make some few observations relating to the statutory rule touching the angle of 45 degrees. The Metropolitan Board of Works, under statutory authority, prescribed, by a bye-law passed in 1856, in effect that every new street within the limits of the Metropolis must be of the width of 40 feet at the least, but if the building fronting any street be more than 40 feet high from the level of the street, then such street must be of a width equal at least to the height of every building above such level. And by *The Metropolitan Local Management Act*, 1862 (25 & 26 Vict. c. 102, s. 85), it was provided that: "No building except a "church or chapel shall be erected on the side of any new street of a less width than 50 feet which "shall exceed in height the distance from the external wall or front of such building to the opposite "side of such street, without the consent in writing of the Metropolitan Board of Works; nor shall "the height of any building so erected be at any time subsequently increased so as to exceed such "distance without such consent, and in determining the height of such building the measurement "shall be taken from the level of the centre of the street immediately opposite the building up to "the parapet or eaves of such building."

Lord Selborne in *The City of London Brewery Company* v. *Tenant*, after stating that with regard to the 45 degrees there was no positive rule of law upon that subject, and that the circumstances that 45 degrees were left unobstructed, was merely an element in the question of fact whether the access of light was unduly interfered with; held that there was "undoubtedly ground for saying that "if the Legislature when making general regulations as to buildings, considered that when new "buildings are erected the light sufficient for the comfortable occupation of them will as a general "rule be obtained if the buildings to be erected opposite to them have not a greater angular elevation "than 45 degrees, the fact that 45 degrees of sky are left unobstructed may, under ordinary "circumstances, be considered *prima facie* evidence that there is not likely to be material injury."

The question again came under consideration by the Master of the Rolls in *Hackett* v. *Baiss*. The plaintiff in that case was the owner of extensive messuages in Jewry Street in the City of London, the owners and occupiers of which had had uninterrrupted enjoyment of light for above twenty years The defendants were erecting a warehouse opposite to the plaintiff's premises on the site of some old buildings, part of which only subtended an angle of 38°, and other part an angle of 27° above the horizon at the centre point of the ground windows of the plaintiff's houses. The defendants desired

to build their warehouse 52 feet high, and had carried it up to the height of 46 feet, which subtended an angle of more than 45o at the foot of the plaintiff's ancient lights by about 1 foot or 1½ feet. His Lordship said:—"The real question I have to decide is this. In a street a good deal narrower "than ordinary streets, not being more than 38 feet 6 inches at any point across, and other parts "only 34 feet, is a building owner entitled to erect a building to a height which will obstruct "the access of light below the 45° degree angle. I say that as a general rule he is not. In cases "of this kind, positive evidence being unobtainable because the building is not erected, you must "go upon theory, and that theory of course must be the opinion of skilled persons—persons who "have paid attention to the effect of buildings on light. But on this point the Court is not left "to guess or to arrive at an arbitrary conclusion upon the evidence of witnesses, because, in the "first place, the point has been considered by the Legislature, and after considering the result of "professional opinions, the Legislature has adopted the angle of 45o as the proper angle, below "which the incidence of light ought not to be permitted to fall, in the case of buildings on the "opposite side of an ordinary street; and that view has been sanctioned by the Court, whose "decisions are binding upon me, even if I differed from them, which I do not." And after referring to *The City of London Brewery Company* v. *Tenant*, his Lordship proceeded:—"So that on being "satisfied that 45° are unobstructed, I ought *prima facie* to come to that conclusion, unless there "is something special in the case. Now what is special in this case is in favour of the Plaintiff. "In the first place, as I have said, the street is rather narrower than it ought to be. The legislative "rule applies to a street of the ordinary width. In the next place, there is some positive evidence "that the present height of 46 feet, a little over 45°, has interfered with the access of light not to an "inconsiderable extent, and has actually caused personal inconvenience to one of the occupiers of the "houses. I do not say that that alone would be conclusive." And an injunction was granted to restrain the defendants from erecting the new building at a greater height than 46 feet from the pavement or base line. This was not however to prevent the defendant from making a sloping roof of a greater height, so long as the angle of incidence of light over the roof to the centre of the ground floor windows of the plaintiff's houses did not exceed 45o.

The subsequent case of *Theed* v. *Debenham* is another illustration of what the Court will consider a special case, to which the rule as to the 45 degrees does not apply. In *Theed* v. *Debenham*, the ancient lights of a sculptor had a north aspect in a street in the metropolis, 31 feet wide. In the course of his profession he required, not only a direct light, but what is technically termed an "under or low light," and which he had hitherto enjoyed. Some of the ancient windows had been enlarged within twenty years. The defendants' old buildings on the opposite side of the street were, as to part, exactly 31 feet high, and as to the other part, a little less than that height. They intended to raise their new buildings so that their new parapet would be 38 feet from the pavement, and their ridge of roof about 7 feet above the new parapet, and they claimed to have a statutory right to raise their building to a height which would subtend an angle of 45°, measured from a base line, level with the centre of the plaintiff's light. It was proved that if the defendants raised the new building to the height proposed the plaintiff would sustain a serious diminution of light, and it was held by Vice-Chancellor Bacon that the statutory regulation as to the height of buildings in streets is not to be taken as limiting the right of prescription to ancient lights, but that such right depends upon the degree and amount of obscuration in each particular case. "In my opinion," said that learned Judge, "they have no more right to take away the light which the plaintiff has been enjoying than they have to take away the front wall of his house," and further, "No man can be heard to say that he may obscure another's ancient light because he has more light than he requires."

On the other hand, where there are no special circumstances, the statutory rule has been held to apply. Thus, in the recent case of *Harris* v. *The London and South Western Bank*, heard before Mr. Justice Fry in the last long vacation, an injunction was successfully resisted on the ground that the new building did not subtend the angle of 45 degrees, and that there was no special circumstance to take the case out of the general rule.

Alteration of Ancient Lights.

The state of the law relating to the *alteration* of ancient lights should be discussed, but it is impossible that I can do justice to so wide a subject within the limits of my present Paper; and I think, therefore, that I ought merely to refer you to the decision of the House of Lords in *Tapling* v. *Jones* which (overruling *Renshaw* v. *Bean* and *Hutchinson* v. *Copestake*) decided that the opening of a new window, being in itself an innocent act, could not therefore destroy existing rights in one party, or give new or revive old rights in another, and that, consequently, when there was an ancient light, and then others were added, and an obstruction was raised against the added lights, which, from their position, could not be obstructed without obstructing the ancient light, such obstruction was illegal. And to refer you also to the recent most important case of *The National Provincial Plate Glass Insurance Company* v. *Prudential Assurance Company*, in which, not only the question as to the alteration of ancient lights, but the considerations on which the question of injunction or damages depends were fully discussed. In that case a building containing ancient lights was pulled down and replaced by another, in which the front was set back and a dormer window converted into a skylight; and it was held that the right to the ancient light was not lost; and that the right remains where any portion of the light which would have passed over the servient tenement through the old windows passes also through the new windows.

Conclusion.

There are other important subjects which ought also to be considered, such, for instance, as the incidents of property or easements acquired by the owners of separate chambers, flats, or storeys, in the same building, in respect of such premises; the right of easements relating to mines; the extinguishment of an easement by unity of possession of the dominant and servient tenements; and the practical remedies for enforcing the rights to easements. It will however be impossible for me even to touch upon any of them now. I fear that I have already trespassed too long upon you, and, in conclusion, I beg to thank you for the reception you have been good enough to accord to this Paper, and to ask that those gentlemen who may do me the honor to think it over, will kindly bear in mind that I have not attempted to present a treatise upon the law of easements, but merely to offer some notes upon that branch of the law only which relates to the essential qualities and acquisition of easements generally, and to some particular easements.

The Meeting then adjourned until Monday the 7th of January, when this Paper will be discussed.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday, January 7, 1878, Mr. Charles Barry, President, in the Chair, the following business took place :—

DISCUSSION ON MR. LOCOCK WEBB'S PAPER—THE LAW OF EASEMENTS.

The Chairman.—We will now open the Discussion on Mr. Locock Webb's comprehensive and interesting Paper. I hope no speaker will exceed ten minutes, which is the suggested limit of a speech, as we must close the Discussion at 9.30 in order to make room for the Paper to follow this evening. Perhaps Professor Lewis will kindly open the Discussion by relating to us a somewhat interesting case in which he was concerned. It is one of which Mr. Locock Webb (if he does not know of it) will be glad to hear the particulars.

Prof. Lewis, Fellow.—I had no notion that I should be called upon to address the Institute this evening, because for very many years I have had very little to do with the vexed questions of light and air. It was simply as the result of an accidental observation which fell from me that I have been asked to address you this evening. I have great pleasure in one respect, however, in being called upon, inasmuch as it gives me the opportunity of proposing a vote of thanks to Mr. Webb for his highly interesting Paper. Whether or not we have been practically concerned in these questions of light and air, we are quite sure that we all have the chance of being so against our will if we do anything in London, especially in the City ; and before you attempt there to build a wall to a greater height than before, it will save you probably a considerable delay of trouble if you study some such authoritative Paper as that with which Mr. Webb has favoured us. It is a most happy accident that our new class of Honorary Associates should have been represented for the first time by so able a man as Mr. Locock Webb, and by so able a Paper as that which he has furnished. The observation which fell from me was regarding a somewhat large building which a good many years ago, on my entry into practice, I had to erect in London. It was thought that there we were perfectly safe in erecting it, because it was known that the lights in the adjoining building had not been possessed for more than sixteen years, and we were advised accordingly. We did build, and possibly may have injured these lights in some small way. An action for this assumed injury was brought, and it was not until heavy expense had been incurred in obtaining evidence to prove that the lights were not ancient that the counsel before whom the whole case was then laid stated that the action could be sustained if damage could be proved to the lights, although they were not ancient ; the attention of our legal advisers being called to a different aspect of the question, which has been very clearly and concisely put by Mr. Webb :—" If A. builds a house on part of his own land, and afterwards sells the house to B. and the land adjoining to C., who obstructs the lights, although the house be a new messuage, yet a person who claims the land by purchase from the builder cannot obstruct the lights any more than the builder himself, who could not derogate from his own grant, for the lights are a necessary and essential part of the house." That was just our own case. We found it exactly as Mr. Locock Webb lays it down here, that notwithstanding those lights were not ancient, yet the mere

fact of the landlord of the two premises having been the same who had conveyed to the person adjoining our land, which was entirely vacant, the exact rights and privileges from that vacant land, so that no one could build at all without the chance of obstructing it, and the result was an extremely heavy bill of costs, although the verdict for the actual damage was to a very small amount. The case made a strong impression upon me, though I was a young man at the time, and I have mentioned it now because I find that the point involved in it is not very commonly understood. That point is very clearly laid down indeed by Mr. Webb, and I thought in talking to some of our friends in the Council that it was rather a new one to some, and our President thereupon requested me to bring it forward, which is my apology for addressing you at all. I have had great pleasure, however, in doing so, inasmuch as it gives me the opportunity of proposing a cordial vote of thanks to Mr. Locock Webb.

Mr. E. I'ANSON, Fellow.—I have much pleasure in seconding the vote of thanks to Mr. Locock Webb, who has written a very able Paper, because he has put very clearly before us several points which we have frequently to consider. I think particularly it deals, in a very intelligible manner, with the question of the angle of 45 degrees which involves what we have been accustomed to regard as rather an empirical rule. In the many questions that arise between joint owners, there are two or three which occur to me as not having been noticed. One of them is the rights of ownership where you take down an old party wall and re-build a new one. In the case of an old party wall having been materially out of the vertical, and the new party wall being re-built vertical, from one side or the other, space must be lost by one owner and gained by another. That point is not touched upon. I recollect such a case at the back of a great hall in Threadneedle Street, now a bank, which was built by a Mr. Moxon, a celebrated speculator some thirty years ago, who was rather keen in support of his supposed right—as many others are who build in the City. My client was an old lady, who was also disposed to be keen. She contended very properly that she ought not to lose an inch of her land. My business was to set out on the level of the ground floor—the wall having been pulled down to that level—the exact centre of the party wall, before it was pulled down below the level of the ground floor. That was done by carefully determining the centre line, and this having been done rods were fastened down to the floor of the house on the lady's side, and were sealed to it and marked with her own seal—the ends of the rods also, where they touched the centre line, were also sealed in like manner—therefore she was quite sure the ends of the rods did indicate the true line of the centre of the wall on the level of the ground floor. When the new wall was built to the topmost storeys, and she came to inhabit the house again, to lay down the carpets and to hang up a bird cage which used to hang between the window and the old wall, the carpet was found too large and had to be cut some three inches, and the birdcage would not fit its old place! The question was where was the tort? and who was responsible for it? I am sorry to say I cannot give you the solution. It got into the hands of the lawyers and, I believe, it never was settled.

The CHAIRMAN.—That may be a reason for the omission.

Mr. I'ANSON.—It is, however, a serious question. Why are you to lose the area of your first, second and third floor because your neighbour has the old party wall rebuilt? It is a question which lawyers, some of these days, may have to decide. Another question arises which has not been touched on, but which only shows how complicated the relations are between adjoining owners. If you pull down a house which has been built ever since, say the Fire of London, you expose the party wall next the adjoining owner, leaving it enclosed by a party wall, built with the not very good bricks which were used just after that event, together with wooden panelling, by which the old wall was covered. What happens when the adjoining owner pulls down his house and removes the

panelling from the side of the wall? Why, this, that the mortar joints never having been very good admit both air and wet. Now, who is responsible for keeping the air and the wet out of the adjoining owner's house? Has he by prescription a right to be sheltered by his neighbour? That is another question which, so far as I know, remains undecided. I have always denied that the adjoining owner had any right to shelter, but I am by no means sure that my law is sound. I cannot enlighten the Meeting, but I only cite these cases to show you illustrations of the complicated relations existing between us, where one owner adjoins another.

Mr. F. Ouvry, F.S.A., Honorary Fellow.—The first point I would touch on is the angle of 45 degrees, which in light and air questions I have found a very broken reed to lean upon. I would refer you to the case of *Jackson* v. *The Duke of Newcastle*, when the Duke was building the large mansion which Lord Granville now occupies. Mr. Jackson had a house in Cockspur Street, and he conceived that the building interfered with his light and air. The Master of the Rolls visited the spot and granted an injunction. I had ample evidence to show that the angle of 45 was not interfered with. The Master of the Rolls, however, came to the conclusion that, whatever the angle might be, the light and air were interfered with, and granted the injunction. I appealed to Lord Westbury, who also went to see the premises, and came to the conclusion that, though there was a certain interference with the light and air, yet, that it was not such an interference as would justify an injunction, and he therefore awarded the gentleman £200. damages. That litigation cost £1000., and I need not tell you that the plaintiff, Mr. Jackson, after paying the extra cost to his solicitor, probably derived very small benefit from the transaction. When this action was decided, there was another man who kept a public-house adjoining, called "The Running Footman," who began to think that his light and air were interfered with. I thought it would not do to have another action, and so one day I took the trouble of walking into "The Running Footman." I saw the landlord and told him who I was and what I had come about. I said at last that the discussion was rather dry, and suggested that probably a pint of ale might be of assistance in settling the question. It ended in my giving him a cheque for £100., and his claims were satisfied. He got more out of it than Mr. Jackson, I have no doubt. If one can settle such a question it is always desirable to do so. Another point I will venture to touch upon is with reference to the right of underground water. There is a passage in the Paper:—"But on the other hand, if A makes a grant of land to B without any exception of the rights to the streams of water in the land, neither A nor anyone claiming under him could, it is conceived, lawfully do anything which would have the effect of draining the underground water or diverting any stream from the land, for such an act would operate as a derogation from A's grant." I quite agree with reference to the streams on the surface, and the water running underground in a defined channel, that the passage cited is quite correct; with regard, however, to the water underground, which has not a defined channel, but which percolates through the land—in that case I conceive that there is no right whatever as between adjoining owners. Therefore it does not strike me (with great deference to Mr. Webb) that there would be any implied covenant on the part of A that B, to whom he has granted that land, should enjoy that underground water, but that B (supposing A had on the land granted to him a well) might dig another well, although it might have the effect of diverting this underground water from A. Mr. Webb does not quote any case, and says it is only conceived it would be so. I do not state it as a positive law, but simply to invite any observation that might occur to him when he replies.

Mr. A. T. Hiscocks, Fellow.—This has certainly been a most interesting Paper and Discussion, for it has to do not merely with rights, but it is a question of property. The question of easements is

certainly a very complicated one, but one which gives the gentlemen of the long robe a good deal to do. Now without going deeply into the point, I would state a case which has just been brought before me to give an opinion upon, where the right of easement may or may not be implied. The easement is implied by the adjoining owner. The case is this:—Some large proprietors sought to rebuild a fence for the better protection of their property. A right of light was claimed by a person —a publican—whose back window was within 6 feet of the said fence. A disturbance ensued, which was ultimately settled by the police. The public-house belonged to very wealthy people, who thought that the rights of their tenant should be preserved. Now I put it to this Meeting whether a man has not a right to put up a fence for the protection of his own property. My opinion is that they have no right whatever to prevent him, there being no parole or deed agreement giving any easement. I give that opinion, at the same time calling your attention to the case that was reported in the *Builder* a few weeks back, (Nov. 24th, 1877,) *Birkett* v. *Hughes*. A gentleman became the leaseholder, and subsequently the freeholder, of a house, 12, Maze Hill, St. Leonards, and his garden was overlooked by a window in Maze Hill Terrace, and he determined that he would try his rights on the question of easement. He employed an architect to put up a substantial fence within 3 feet of the windows. There were no houses there 30 years ago, and there could be no right of light from his premises. The adjoining owner cut down the fence, and the magistrates decided that the persons who cut down the fence were entirely wrong, and ordered them to pay the costs: fined £1. and £2. 4s. damages and costs.

Mr. J. JENNINGS, Fellow.—I have a little hesitation in rising to address you on an occasion like the present, because I no longer take an active part in the profession. There are, however, various cases which are not referred to in this Paper, which appear to me to be important; and as we are all much interested in what the state of the law is, and as it is likely to be altered, I think it important that we should mention as many cases as we can which are affected by the question of easements. I do not know whether, on a previous occasion, I referred to a case which I had to do with some thirty years ago on the bank of a canal in Westmoreland; and the main facts are, that the company at a certain point sold land 50 or 60 feet wide adjoining the towing-path, with an idea of its ultimately—when built upon by the purchaser—increasing the trade of the Canal Company. But during the time they were waiting for the improvement, the adjoining owner built a seven-storey flax-mill, with all the windows overlooking the land and canal. The gentleman for whom I acted could not by any possibility stop up those windows, as, to put up a hoard to their full height, would have cost more than the value of the land at that time. So far as I am aware there is no remedy if persons put up buildings under such circumstances; therefore I think it most desirable that, whenever the law is altered (and I think it should be altered in several respects), there should be no right of light except by grant. In the cases referred to in Mr. Webb's Paper, he speaks, of course, of the implied grant, where the same party owned the property previously; but I should be glad, if there must be an absolute grant of light defining its extent, to give a person the right to it. There is another point which has not been referred to, viz.—the public right acquired over a limited right of easement. There is a case which probably Mr. Webb is aware of, as he is a tenant in part of the estates, where there is a public way across a leasehold of originally 200 years. The parish have taken possession, and at the termination of the lease I am not at all aware what remedy the landlord would have. I do not imagine (taking into consideration the other case I have mentioned) that it would be possible for him to stop up the road when it comes into his hands at a future period, ninety years hence. The difficulty actually did arise in a case where the Eastern Counties Railway Company took some land; the Weavers' Company found they could get no compensation, because

the public had acquired a right over a portion of the land during the 200 years' lease. These are questions which, I think, are worthy of consideration. I have not seen any reference to some other cases of increasing use of easements, which is quite satisfactory to me. When I was a young man, it was always considered that if we could not stop up new lights in the upper part of a building without interfering with the lower ones, then we might interfere with the lower ones. That, I understand, is not the law at present. It does not appear from this Paper whether it would extend to other easements. In the case, for instance, of a roof where there has been a right for water to run on to the roof of an adjoining house, suppose from a surface 50 feet square, if the house is increased in size by the addition of another 50 feet I do not see what the remedy would be, as, if there is no power to stop the old easement, it would necessarily be impossible to stop the new one. As regards another point, viz. party-walls out of London, they are not regulated by the Metropolitan Building Act, and I have found great difficulty in dealing with them. Is there a right to raise a party-wall on a freehold? This point will arise in London, unless the law is altered. Since the Bristol case, it is probable that we cannot raise a wall which has dropping eaves to it: previously we could do it. There is a further point, as to drainage. In many cases where the adjoining building is carried to a much greater depth, the soil is so drained as to lower the whole of the ground, and the water, being drawn away, serious fractures arise. How far a person has a right in that case to drain their neighbours' land does not appear in this Paper.

Mr. H. DAWSON, Fellow.—I wish to call the attention of the Meeting to two or three points in the Paper: First, as to the mention therein of the decision in the case of *Yates* v. *Jack*. I suppose we may take that decision of Lord Cranworth to have been overruled by the later decisions of Lord Justice James and others. Let me ask you to consider the words:—"The owner of ancient lights was entitled not only to sufficient light for the purpose of his then business, but to all the light which he had enjoyed previously to the interruption sought to be restrained." Now, those are strong words; but they seem to be contradicted by the subsequent decisions of Lord Justice James and others, viz., in *Kelk* v. *Pearson*, the judgment distinctly states that the nature and extent of the right are to be understood as the amount of light which is sufficient for ordinary purposes—that is, for comfortable use and enjoyment if a dwelling-house, or for beneficial use and occupation if a warehouse, shop, &c. It goes on to say that the extent of the easement is "a right to prevent your neighbour from building upon his land so as to obstruct the access of sufficient light and air to such an extent as to render the house substantially less comfortable and enjoyable." You can see readily that the latter decision left the question open as to what is substantially less comfortable and enjoyable, whereas Lord Cranworth tells us "the owner is entitled to the whole light he had previous to interruption." The next point is at page 95:—In *Tapling* v. *Jones*, Lord Westbury said—"After an enjoyment of an access of light for twenty years without interruption, the right is declared by the statute to be absolute and indefeasible; and it would seem, therefore, that it cannot be lost or defeated by a subsequent temporary intermission of enjoyment." One would like to know what is the meaning of "a temporary intermission of enjoyment;" because a case occurred lately where premises were pulled down for the purpose of rebuilding, and the ground was not covered for two years; and it was pretended to be agreed on the other side (I do not believe in the argument) that the ground being left uncovered for two years, the right of the ancient lights was lost! The argument of the servient owner ran thus: "You have not," he said, "got any ancient lights, for where are they? You have only vacant land; you have been so long in rebuilding that you have forfeited your rights." I may say at once that there was no doubt whatever as to there having been an uninterrupted enjoyment of light to the old building pulled down for many more

than twenty years, and therefore it had become a matter of property and of absolute and indefeasible right. My natural reply was, that the contention for the loss of such an ancient right merely on account of the delay in rebuilding the premises was simply absurd, for there always was some delay, and the delay in this case was only greater *in degree* than usual, on account of ordinary disputes as to party-walls and like questions. The question therefore remains, What must be understood by "the temporary intermission of enjoyment?" Another important question raised in the Paper is the oft-mentioned angle of 45 degrees. Mr. Webb mentions that the Metropolitan Local Management Act provides that no building shall be erected to a height above the pavement greater than the width of the street, where the street is of a less width than fifty feet. I am not aware that that regulation has been strictly or universally carried out; but if it could be carried out in a modified way in many of our streets, it would be a very admirable improvement to accomplish. I have proposed it once or twice to my professional brethren in discussing at various times the rights of our respective clients, but we never can command sufficient property on either side to carry it out; but if a bye-law could be made to this effect it would not only get rid of a great many troublesome cases, but add, in my judgment, very much to the picturesqueness of our streets. It is a rule which I do not think it would be difficult to establish on some such plan as I will now attempt to describe. In the case of our main streets, which are 45 feet wide, or over, it might always be insisted that the buildings on each side should be built and maintained to such a height so that there shall always be 45 degrees of direct sky light received by each house from the zenith to the top of the parapet of the opposite house, the line of the angle of 45 degrees being taken from the centre of the ground floor window on each side. In the instances where streets are less than 45 feet wide—say up to 30 feet—you would still, I think, have to keep the extreme height above the street pavement not less that 45 feet, or the sacrifice of space would be too great; and then let any storeys above that height be set back on each side, and kept below the produced line of light drawn from the centre of the ground storey window to the opposite parapet. It would really form a very picturesque innovation in the elevations of our houses, and I do not think it would substantially injure anyone. It would give ground, first and second floors in all the foregoing instances; and third floors, we know, are frequently unprofitable tenements. When streets are less than 30 feet wide, the points must be reduced in height proportionately. Then I would just refer to the mistaken use often made of this angle of 45 degrees; and it is a very essential point, indeed, viz.: that where you have a wide main street from 45 to 70 feet wide, then the angle of 45 degrees comes in very usefully as an argument as to the sufficiency of the light. But I have had this argument forced upon me on all occasions as if it were a statutory enactment so made, without regard to the question where the house is situated, that I wish to indicate where it is, does not apply. Now we know that many houses in cities have their windows situated in, at the bottom of what we may call, wells or areas of light, and closely enclosed on both sides by other houses. Of course the two cases are palpably different, and it would be monstrous to say, if a dominant owner in these situations is left with an uninterrupted light opposite to his windows, to an angle of 45 degrees, and had more than that previous to the opposite building being raised, that therefore this angle of 45 degrees should govern and determine the extent of his right.

Mr. T. CHATFEILD CLARKE, Fellow.—I should like to pay my meed of thanks to Mr. Webb for his very excellent Paper—the more so because, in the course of practice, I have had to meet him on more occasions than one, and I know how very stiff an antagonist he is, and how thoroughly he does his duty to his clients. He has cited two or three very important cases which will be

remembered well by some of those present, because they were engaged in them. The case of *Leech* v. *Schweder* was one out of which important results arose. It is curious that Professor Lewis should have referred to a point very much bearing upon that case, but perhaps without keeping in mind the essential point which Mr. Locock Webb recites in the latter part of the case, and which was the real substance of the reversal of Sir George Jessel's judgment, and that was that there must be a materiality of damage. I apprehend that the case failed when it came before the Lord's Justices, because the plaintiffs were unable to show a materiality of damage, and as that case has long gone by, and as my friend Mr. Currey is in the room, who was also called in at a later stage, it might be matter of information to many young architects to state what was the result in that case. The screen, as Mr. Webb justly set out, was erected 30 feet high against the sky-line of the plaintiff, and was from 60 feet to 70 feet long. As the case has long gone by I recite it as my own unprejudiced opinion, that in standing with my back to the screen, with that very considerable obstruction, I could not tell when the screen was up and when the screen was down. It is a curious fact, and shows how difficult it is to express an empirical opinion about the fact of obstruction of light, that it was very difficult to detect that there was any difference whatever. With regard to the case of *Leech* v. *Schweder* the Master of the Rolls went to a very considerable length. He laid it down that if there was damage to so much as the extent of a shilling he felt bound to give the perpetual injunction. That case was of very great importance, and was a case which was, as you know, very extensively fought. Mr. Webb recites, at the end of his Paper, another case of very considerable importance, which was named before *The National Plate Glass Company* v. *The Prudential Assurance Company*. I was very glad to see that our professional papers called attention to the importance of that case, because it even went further, I think, than what Mr. Webb recites. If I understand the judgment of Mr. Justice Fry aright, he held that the access of light must be undisturbed. That was recited in the *Architect*, and was the effect of the judgment. It was a most curious case, in which the plaintiffs had not only altered their skylight but rebuilt their premises, and taken away a certain covering that there was to the pre-existing skylight, and had a shaft of light direct from the heavens. They did not, however, get an injunction, though they were enabled to recover damages from the defendant. That is a very important case, and has established, I think, in the experience of many men in the City of London, almost a new doctrine—carrying the point very much further than it has been carried in my experience for many years. Now, after having touched upon this very able and clear Paper, it appears to me that the practical question for the Institute to consider is, what can be done to do away with the cruel hardship and great annoyance, and great loss of property which occurs by these constant suits and the difficulties which arise. And if any gentleman can throw out any practical hints—if Mr. Webb himself can—as to how these questions can be dealt with, he will be doing an essential service. I, on one occasion, threw out the suggestion of there being a *compulsory* reference to avoid the enormous expense of law and its great uncertainty. I do not know whether that would meet with the favourable judgment of those present. There is no doubt at the present moment this is a pressing practical difficulty at every step in building in the City. I have ventured, therefore, to put the matter clearly before you—at the same time to say that no doubt it presses upon all our minds that the English law cannot and is not to be expected to make a man submit to an arbitrary decision on a point like this. Perhaps it is wrong to take from any man compulsorily any amount of his light and make him submit to take a certain sum in damages. Probably that is contrary to the spirit of English law; but on the other hand, the inconvenience is so great, so many avenues are opened for serious interference with the development of property, and so many opportunities are afforded for litigation, when the effort is often one merely to extort money,

that a remedy is urgently demanded. In one street in the City of London within the last three months I know of some speculators who having erected large buildings to a great height some few years since, directly that the parties commenced to rebuild upon the opposite side, said, "You shan't lay a brick upon your walls beyond the former height." After having themselves injured the light of the property, they turn round, and the law entitles them to turn round by its peculiar state, and under certain circumstances, and say, "You shan't lay a brick in raising your premises." That being the state of the law, I do think that if some clear-headed lawyer coupled with an architect were to try and arrange some bill and bring it into the House of Lords or Commons that the question ought to be more capable of solution than it has been. Certainly, wherever you come to an arrangement between parties, if one man goes to a certain height, you should in a spirit of equity give the opposite party the right to go to the same height. I throw out these suggestions with great reluctance, but the whole question has become a very pressing and a very practical one, and we are deeply indebted to Mr. Webb for having brought it before us.

Professor KERR, Fellow.—Mr. Chatfeild Clarke has raised a point which is far more practical than any mere question of what the law of ancient lights may be. I would take leave not to presume to answer his question, for Mr. Webb will do that very much better, but to contribute what I can in two ways towards the solution of the problem. For a great many years I myself have been in the habit of attempting to reduce to something like mathematical form the precise issue as to the amount of light obstructed. I beg leave to show you by this model how I think this can be done. I place a half hemisphere of glass—to represent the sky—in front of and surrounding what may be called a window. By dividing the glass surface both laterally and vertically into squares of say 10 degrees, it is sufficiently easy to calculate what the comparative values of these portions must be.* It is then equally easy to project upon this half hemisphere the exact condition of the old sky line, and of the new, as visible from the window. Otherwise, the same thing may be done on a plane surface—that is, on a sheet of drawing-paper—by using Mercator's projection. All that there remains to be done is to reckon up the value of the obscured sky, and the mathematical result cannot be disputed. You can thus affirm at any rate that the obscuration is precisely so much per cent. of the lighting formerly enjoyed. But I am afraid, after all, that this does not help you in the courts of law. In the first place, they won't pay attention to mathematical calculations. You get upon the issue, in the second place, whether the plaintiff is not entitled, as some gentleman has pointed out, to the whole of the light which he formerly enjoyed. Then, if this be got over, the question of the materiality of damage is still left for the judgment of the court or the jury. The conclusion which I have ventured to come to after a great deal of experience in these questions of light and air is that there is no practical law upon the subject whatever, and that no man can tell you beforehand what will be the issue of any controversy, and that no man—and I rather think Mr. Locock Webb as a lawyer will bear me out in saying this—can determine with anything like the precision needful to guide an architect in his design what will be the opinion which the court may form, or which a jury may form, on the question of materiality. It must be remembered that this right of light, as it is called, is practically a statutory right. Most of us are so accustomed to hear it spoken of that we imagine it is a right arising out of one's own consciousness of the justice of the matter; but it is obvious that the right and wrong of the matter is this:—let every man build on his own land, and let every man derive his light from his own land, or from the public street. England is the paradise of vested interests, and long may it continue to be so. In France our law of ancient lights would not be

* See Institute Transactions some years ago—Paper by Mr. Tarn.

tolerated. In America it would be absolutely impossible, I think, to understand the idea. What it may be in Germany I do not know. Seeing, however, that the law is in such great uncertainty, and that the question of materiality can only be determined upon the evidence of architects, they have the matter at least thus far in their own hands—that unless other architects will come forward and give evidence of the materiality of the damage, it is scarcely possible to prove a case. I do not find architects so ready to keep to the defendant's side as I think they ought to be. I say it plainly. If a man comes to me with a defence, I take it up without inquiring any further; but if he comes to me as the plaintiff, or representing him, I must have it investigated before I will take it up at all. I will venture a little further, and say my experience has led me to this—that in nine cases out of ten these actions about light and air are based upon something very different from the sense of having suffered injustice. I state that deliberately and advisedly as my experience; and I think that if architects would do as I suggest—take up a defendant's case with alacrity, but take up a plaintiff's case with very considerable hesitation—they would not have to complain, as they do most justly, of the obstacles which are placed in the way of improving London and other large towns by these most mischievous actions. I might, as others have done, give you anecdotes; but I really think they are of very little avail. Mr. Webb will no doubt tell us that we do not understand the law of the matter. If he does not tell us that, he ought to do so: that will at all events be his impression. We have to go to the lawyers for the law, and I am always sorry to hear architects talking too much about it. Architects have to build; lawyers must unfortunately administer the law of building; but if architects would hesitate a little more to come forward as witnesses against the business of brother architects, less harm would be done. "Love me, love my building"; and those who put obstacles in the way of honest building ought not to be able to get architectural evidence to support their cases.

Mr. C. Locock Webb, Q.C., Hon. Associate.—I am very much obliged for the kind remarks you have made, Mr. Chairman, and I will now venture to make a few observations upon the very able arguments which have been addressed to us by the various speakers. Time will hardly permit me to consider them as I should wish. Some I will pass over quickly, giving more attention in my remarks to matters of law than matters of fact. I propose to take the arguments of the several speakers *seriatim*, bearing in mind that I have only ten minutes during which I may occupy your time. The first speaker was Professor Hayter Lewis, who proposed a vote of thanks to me in most kind terms, for which I feel much obliged. As I understood his arguments they came to this, that looking at the case I referred to of *Palmer* v. *Fletcher*, he finds a certain old rule of law laid down in the time of Elizabeth; but if he had been good enough to cast his eye down that self-same paragraph in the print, at page 89, he would have found that the rule of law, as enunciated in *Palmer* v. *Fletcher*, was expressly endorsed and upheld by Lord Chief Justice Tindal in *Swansborough* v. *Coventry*, and by Lord Tenterden in *Riviere* v. *Bower*. One might have given many additional cases without the slightest difficulty. Therefore with regard to that old case I think I did not give a bad criterion when I went to the root of the tree of law which still lives. Then there was one matter that he rather found fault with, and that is the application of the law. I could not help thinking, when following his remarks as closely as I could, that he almost answered himself, because he told us in that most interesting case which he mentioned, that his clients went to consult eminent lawyers *after* the damage had been done. All I can say is that if his clients had taken that course before they took proceedings, probably they would not have incurred the enormous expense they did before they found out what their rights were. The wise plan would have been for his clients to have consulted an able lawyer in the first instance, and asked how far they could go.

Professor Lewis.—I did so.

The CHAIRMAN.—That is certainly what Professor Lewis stated, and he added that they advised him wrongly, as his clients subsequently found to their cost.

Mr. LOCOCK WEBB.—He did not put in the word *able* lawyers; and therefore I did not forget to use the word *able*. Mr. I'Anson mentioned a very important question with regard to a party wall, but I own that, though I followed as closely as I could his remarks, I did not quite see the point of law involved. As I understood him, the wall had become bent out of its perpendicular, and to that extent it over-hung the adjoining land, and continued so for a great number of years, until it was pulled down. I know no case like that, but this occurred to me: assume for a moment that there had been any right of easement obtained by the bulging out of the wall, which I do not admit, and the person to whom the wall belonged claimed the right to build his new wall perpendicular with the extremity of the bend, what right would he have had to have gone upon his neighbour's property to have laid the foundation of the wall? You must first of all, I think, in order to obtain an easement such as that, show that the full right to the user for that purpose of the neighbouring land had been acquired by grant, or assumed grant; otherwise the owner of the wall could not, as of right, rebuild it so as to affect his neighbour's property, except upon the old foundation. A point which Mr. Ouvry mentioned was with regard to the angle of 45 degrees, and he cited the case of *Jackson* v. *the Duke of Newcastle*. I well recollect that case, but if I mistake not it has been overruled, and one learned Judge has recently expressed an opinion differing from the view taken by Lord Westbury on the Appeal, that the view taken by Lord Romilly, who granted an injunction in the Duke of Newcastle's case, was the right one. I think that the present Master of the Rolls referred to that case in *Aynsley* v. *Glover*.

I think that Sir George Jessel, in *Aynsley* v. *Glover*, followed also a decision of the Court of Appeal subsequent in point of date to the Duke of Newcastle's case. Mr. Ouvry raised also a most important question with regard to easements underground or subterraneous channels, and he was good enough to draw attention to some words which I acknowledge are my own, at pages 92 and 93. But I think he rather overlooked the controlling part of the sentence, which is:—"If A makes a grant to B without any exception to the rights to the streams of water in the land, then neither A nor anyone claiming under him could take away those rights." That I conceive to be consonant with justice and consonant with all the ruling authorities on the point. Let me put a counter proposition. If A were to make a grant to B of land and streams of water, and was enabled immediately after to sink a well and dry up or divert the streams, B would no longer have the full benefit of the property which he bought of A. Surely such a state of things would not be consonant with justice. I think that I have correctly stated the rule of law upon the point, although, as a matter of course, in laying down any general rule of law there may be exceptions. But I do not say that the case put by Mr. Ouvry has referred to would constitute any such exception. The next speaker was Mr. Hiscock, who referred to the fence question. I regret to say I did not quite follow him. As I understood his case, it was a claim to erect a fence, but I did not quite see how that could be called an easement, because a fence would be erected on somebody's property. He did not tell us whether it was the property of the man to whom the terrace of houses belonged or not. I cannot make any suggestion to extricate him from his difficulty, seeing that I did not understand his case.

Mr. HISCOCKS.—The fence belonged to the owner of the large property, and no claim had been set up as to easement.

Mr. LOCOCK WEBB.—I am afraid I must have the case before me ere I can give an opinion. Mr. Jennings raised the question as to the rights of surplus lands sold to a railway. Did it not

occur to him that there are special clauses in the Lands' Consolidation Act by which railway companies are governed in such matters?

Mr. JENNINGS.—It was before the Railway Act.

Mr. LOCOCK WEBB.—The old Railway and Canal Acts had clauses which were to a great extent embodied in the Public General Act. If he looks back he will find that there are clauses referring to surplus lands in those special Acts very much the same as there are in the Lands' Clauses Consolidation Act. With regard to the sale of surplus land, if a railway company buys land of a land owner that is not required for the purpose of the railway and it becomes surplus, unless they have some special case they have no absolute right to sell it to anyone they please. The land owner who was the vendor to the company may have the right to say to the company, "It is surplus land and you don't want it, and I have a right of pre-emption." The case referred to by Mr. Jennings was no doubt some railway companies have wanted to dispose of their surplus land, but they found themselves in that position. That, however, is a special case, which really does not apply to the matter before us, being that relating to easements. Then he referred to public rights, and reminded me that I happened to be a leaseholder of some property in which some member of his family happens to be interested. I do not think I should be right in giving an opinion upon the point to which he referred, I might possibly tell him how very wrong he is and how he may find himself in the position that Professor Lewis spoke of, viz., after having given himself a great deal of trouble he may discover that he has no case.

Then came Mr. Dawson, who made and raised some very important observations and arguments upon three points: First of all as to *Clarke* v. *Clarke*, decided by Lord Cranworth. No doubt that case was one of considerable importance; but he will find, at page 95, that Lord Cranworth substantially reversed his own decision in the case of *Yates* v. *Jack*, and therefore it remained for a very little while law. If there had been the slightest doubt as to two decisions pronounced by the same learned Judge, the case has been set at rest since. In *Martin* v. *Headon*, referred to at page 96, the question raised in *Clarke* v. *Clarke* came expressly before Vice-Chancellor Kindersley—that question in particular—and he decided that there was no distinction whatever to be drawn between the rights to light and air in regard to town and country houses. But, Mr. Dawson asks, "What is the substantial damage"? I could not venture to give an opinion upon a hypothetical case. When such a question comes before the Court, it is for the plaintiff to make out substantial damage and to prove his case, and upon the facts in evidence the case is dealt with; but I do not think the Court ever lays down any rule of law upon a mere suppositious case. The evidence must sufficiently establish a case of substantial damage. I mean establish to the satisfaction of the Court what is the reasonable damage sustained—reasonable to the minds of persons competent to form a judgment:—that probably would be the measure of substantial damage to the owner of the property affected. Mr. Dawson also dealt with the question, "What is temporary intermission?" and he seemed to infer that the space of two years would not be sufficient. I am very much inclined to think that if there had been two years' continuous interruption he would not have a very clear ground to proceed upon. I cannot now touch upon the Metropolitan Building Act which he referred to, but he will find it laid down that a street should be 40 feet wide in London—in the City. The able arguments of Professor Kerr and Mr. Chatfeild Clarke would take me some considerable time to deal with, and therefore I am afraid to touch upon them, because, in the short space of time left to me, I should be quite unable to do them justice. I can only thank them for the kind terms in which they referred to my Paper, and to myself personally. I agree entirely with Mr. Chatfeild Clarke as to the importance of the case of *Leech* v. *Schweder*, but he must not assume that the result

of the erection of the screen in that case was satisfactory to everybody: it was not so satisfactory to all of us as it was to those who were fortunate enough to win. I cannot even touch upon the principles of the decision in *Leech* v. *Schweder*, nor upon the case of the *Provincial Plate Glass Company* v. *The Prudential Life Assurance Company*, which he also referred to. He asked, however, whether any suggestion could be made by which disputes relating to light and air might be settled without a costly appeal to the law. Well, I have a pet scheme; but I would rather not state it now, because when a new scheme has to be put forward, possibly for the first time, a few words are required in order to convey its full purport intelligently to the minds of those to whom it is addressed, and to show that it is reasonable and just. That task must therefore, Sir, be postponed to some other opportunity. Professor Kerr seems to be under the impression that the Courts do not attach any weight to mathematical propositions, or proofs, with regard to light. I have been opposed to him, and have also had the pleasure of having him on my side, I think, several times, and I do not go with the Professor in that opinion, because I know how much importance has been attached to his evidence, based upon mathematical propositions, or proofs, on occasions when he has been on the right side. He advised the profession to take up defendants' cases. Of course: "but," he says, "look well into the plaintiffs' cases too." That is extremely wise advice, because a prudent man never rushes into litigation, especially on a light and air case, unless he first of all gets the very best opinion he can as to his rights — such an opinion, I mean, as Professor Lewis referred to. In very few cases indeed, probably, would you find, where proper care and precaution is taken by a plaintiff to be well advised as to his rights before he commences litigation, when he comes to fight (unless, indeed, he fails in his facts) that he loses his case. Therefore, I think Professor Kerr is perfectly right, because defendants as a rule want all the assistance that can be given them. I can only conclude by thanking my audience for the patience and attention accorded to me, and the several speakers for the complimentary remarks they have made concerning the Paper and myself individually.

The PRESIDENT.—Justice to our friend Mr. Horace Jones, who is to read the next Paper, induces me to refrain from any of those remarks which I should like to have made upon the very interesting Paper we have had under consideration. I will only record my opinion (and I am sure it is that of all present) that Mr. Webb's Paper will be a most valuable addition to our archives for reference; and as he has found such great difficulty, owing to limited time, in imparting that knowledge which he is so well able to give, I hope he will be good enough to take two suggestions which I have to make: one is, that inasmuch as his remarks will be sent to him for revision that he will be good enough to amplify them to any extent which he may feel the necessities of the case demand, in order to make up for the shortness of time within which his remarks have had to be compressed; and next that on the several new positions which I was sure he could not as a lawyer help opening, he will favour us on a future occasion with another Paper as valuable as the present one. We are most anxious to have the advantage of the knowledge he possesses, and if we cannot have it in his own eloquent words now, we shall be glad to read it in the shape in which he will have the opportunity of submitting it to us.

The Discussion having thus been brought to a close the President invited Mr. Horace Jones to read his Paper on "The Metropolitan Meat Markets" (for which see next page).

ON THE NEW METROPOLITAN MARKETS.

By Horace Jones, Fellow.

Mr. President and Gentlemen.—In obedience to the request of the Committee appointed by your Council to procure and select Papers to be read at Ordinary Meetings of this Institute, I have the honour to attend you this evening and lay before you some few notes and facts on "The Metropolitan Markets." If there has been some labour in the compilation and preparation of these facts and notes on my side, I fear I may have to call on you for some attention and patience which will be a full equivalent on your part for the time I have expended on mine. But I trust you will not find me unnecessarily prosy or prolix.

Whether when Brutus, who we are told by one of our great poets founded London, dedicated any special site to a market-place or built any market-house I cannot tell you, nor indeed does it very materially concern us now to enquire the precise date or site of the first market in London. Some remarks that I shall have to bring before you might be the text for much discussion on this subject. Suffice it for the present to say that there is little doubt that the sites of more than one of the present markets of London are identical with markets held there before any historical or documental notice of them occurs or is known. Some early dates and notices of them I shall allude to presently.

At present there are throughout the metropolis some forty or fifty places at least which are more or less known and frequented as markets for the sale of provisions, some consisting only of a few stalls or stands, and even those stalls or stands moveable; others rising to a sufficient dignity to be brought before your notice this evening. Of these, some are wholesale as well as retail, *i.e.*, that is supplying both the dealer or retailer and the consumer. One or two alone have the greatest portion of the trade devoted to wholesale business, and in one special instance, indeed, may properly be considered not only as a Metropolitan market, but an Imperial one.

It is impossible in considering the subject before us to ignore entirely the importance and peculiarities of the market-places and market-houses of the provinces, as well as of the continent, though time will only permit a passing allusion to them. Not a bad type of the provincial market-house of some century or century and a half ago may now be seen within a few yards of Oxford Street, built when that part of the present metropolis was quite an outlying district, connected, it is true, by Oxford Road, but disjoined from the City of London by pleasant Bloomsbury fields and lanes; the village of St. Giles being a sort of half-way resting place; probably at that time the abode of a rural innocence long since departed. Of the various others, of course, first comes Covent Garden, famous throughout the world for its fruit, flowers, and vegetables. The name of this well-known place is one of the many instances of popular corruption. We are told that there was as early as the thirteenth century a large piece of ground known as the Convent Garden belonging to Westminster Abbey. "In 1560 it consisted of an oblong walled space, sprinkled over with trees "and some three or four cottages. In 1827 the Duke of Bedford obtained an Act for rebuilding the "market, and the irregular sheds and standings began to be removed in 1828." The present buildings were designed by and erected under the superintendence of the late Mr. Fowler (a Vice-President, one of the founders of this Institute, and father of our esteemed member), and consist of a

centre arcade with two side rows of shops, intersected in the centre by another arcade at right angles, the whole being completed at the expense of John, sixth Duke of Bedford. The market has since extended itself and overflows into the adjoining streets, besides which a large new wholesale flower market has been added, and I fancy the entire area used for market purposes may be roughly estimated as between four and five acres. The Borough, Spitalfields and Farringdon, all of them, like Covent Garden, are devoted to the sale of fruits, flowers, and vegetables.

Again, certain of the railways have made a sort of market of their own at their termini, as, for instance, the Great Northern, which has, I believe, at King's Cross one of the largest potato markets in London. The market that at one time in old London was the largest and most frequented has long since vanished, viz., The Stocks Market, and on part of its site now stands the Mansion House. The Stocks Market is spoken of as being an ancient market five and a half centuries ago, viz., in 1312. Honey Lane, the site of another old market, now affords a classical education to the sons of citizens; Farringdon still lingers; Hungerford, designed, as well as Covent Garden, by the late Mr. Fowler, has made room for a railway; Newgate has been translated, and also to a great extent Whitechapel. As to Newgate Market, it originally was confined to a small quadrangular area, and which area had alone market rights; but during the last fifty or sixty years it had not only spread itself over the surrounding streets, but had absorbed the College of Physicians soon after that august body moved to a more fashionable locality; and a very few years ago the busiest part of the market was in the Rotunda, built by Sir C. Wren, doubtless well remembered by most of us. Garth alludes to this building as—

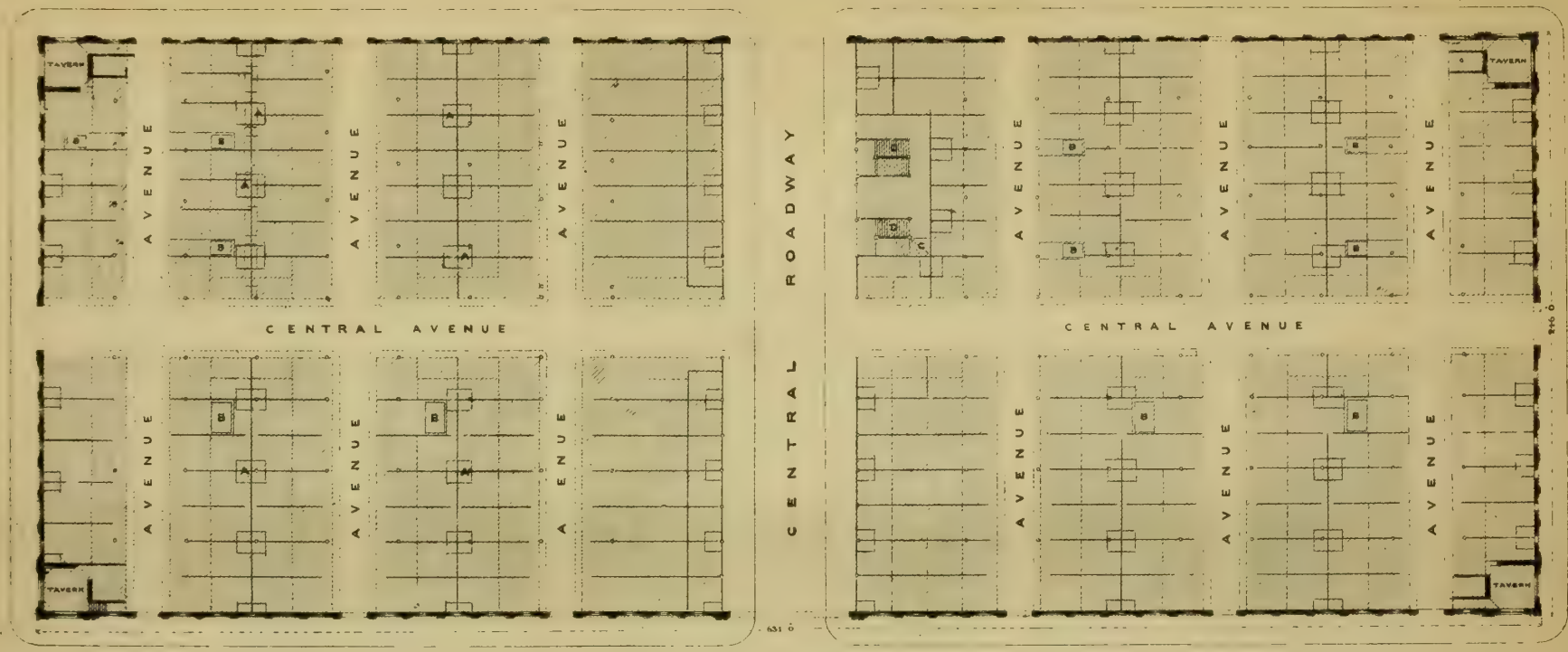
> Where stands a dome majestic to the sight,
> And sumptuous arches bear its oval height;
> A golden globe placed high with artful skill,
> Seems to the distant sight a gilded pill.

The quadrangular area, or original market, was let some three or four years ago for building purposes, and is now, I believe, entirely occupied by the book trade. In the extreme East, Columbia—fair Columbia—worthy of a better fate than it has met with, must not be passed by without a passing notice. It is a large and handsome building to which the ample funds of a philanthropic and munificent baroness have been liberally applied, and in its design and construction the skill of one of our Fellows is tastefully shown.

I will not weary you with a list and notice of very many others, merely enumerating the special Metropolitan markets under the charge of the Lords of the Markets of this City and within seven miles of it. Leadenhall still preserves to no small extent its poultry market and some retail business in other provisions, but its site and size will probably lead to its change of occupation before many years pass. There are also the two large outlying markets, viz., in the north, the Islington Cattle Market, and on the south-east, Deptford Market. Both of them are for live cattle; the one at Islington is partially used as a store cattle market, whilst that at Deptford is for the foreign cattle trade, and all importations into that market are slaughtered there, none leaving it alive.

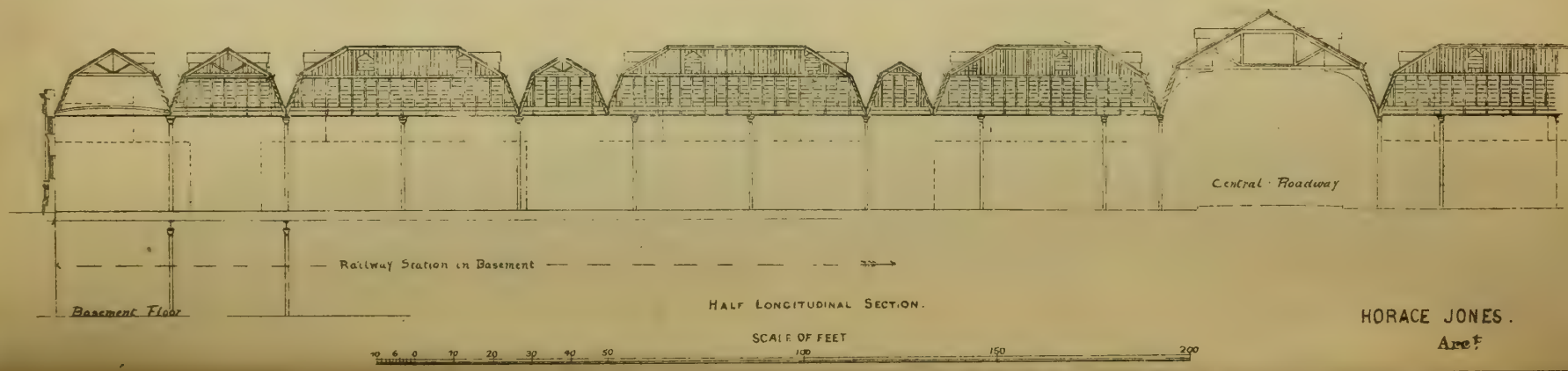
I would here, in passing (time being short), observe with regard to these two markets that Islington Cattle Market is situate nearly a mile from King's Cross, up Maiden Lane (one of the oldest thoroughfares out of London) where stood Copenhagen House, said to have derived its name from the circumstance of a Danish prince having resided here during the great plague. This property and the surrounding fields, to the extent of nearly 100 acres, were purchased by the Corporation, who erected on it the Metropolitan Cattle Market, to supply the place of Smithfield. The market place is a quadrangle, with a lofty clock tower in the centre, and at each of the four corners a tavern, the open area being set off into divisions for the different kinds of live stock, and nearly half a million of money has been expended on the buildings and land.

LONDON CENTRAL MEAT MARKET



A Stairs in Shops
B Lifts from Basement
C Stairs to Market Clerks Offices
D Stairs to Basement

GROUND PLAN



HALF LONGITUDINAL SECTION.

SCALE OF FEET

HORACE JONES.
Arch.t

Photo-Lithog.d for the R.I.B.A. by C.F. Kell, London.

Photo-Lith.d for the RIBA by C.F.Kell London

LONDON CENTRAL MEAT MARKET.

HORACE JONES.
Arch.t

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MEAT MARKET.

The open space of the Market will accommodate at one time 7,000 or 8,000 cattle, and 40,000 or 50,000 sheep, with a proportionate number of calves and pigs, for which latter are provided covered sheds. In the centre of the whole area is a twelve-sided structure, surmounted by a campanile, and in this structure are twelve sets of offices, occupied by bankers, salesmen and others. There is lairage space, contiguous to the Market area, for all the animals brought into the Market. Slaughterhouses have also been erected with sufficient accommodation for killing and dressing during the week very nearly all the animals sold there. The Hide Market, formerly in Leadenhall, has also recently been removed here.

The Foreign Cattle Market at Deptford is on the site of the Royal Dockyard, which first gave consequence to Deptford, and gradually increased its population and importance as a maritime vicinage to London. The Dockyard was established by Henry VIII. about the beginning of his reign. The old store house, which appears to have consisted only of the building on the north side of the quadrangle, was erected by him in the year 1513, as appears by a date on what was originally the front of the building. Above the date is a space where it is probable the Royal Arms were fixed; the initials "H. R.," in cypher, accompanying the date, which is in Arabic numerals, with the letters "A. X." for Anno Christi. A double front towards the north was added in 1721. There is a current tradition, for which no authority can be adduced, that this storehouse was erected on the site of a monastery. The "Cambridge" of 80 guns, the "Impregnable" of 90, the "Windsor Castle" of 98, and the "Neptune" of 98, were built in this yard. Peter the Great of Russia lived at Evelyn's House, Say's Court, while learning ship-building here in 1698, and worked in shed C for some time. The Dockyard was bought by the Corporation, at a cost of nearly £100,000, for the formation of a market for foreign cattle. The slips where the ships had been built were filled up and paved, and supplied with divisions and pens, &c., and various other alterations made, and it was opened for use on the 28th December, 1871. The area of the market is about 22 acres, and three jetties or landing-stages have been erected.

There alone remain to notice four more markets lately erected, or in course of erection, by the Corporation of the City of London, viz., the Metropolitan Meat Market, the Poultry and Provision Market, and the intended Vegetable Market at Smithfield, of which latter the foundations are now being executed on the adjoining land. All of these are in the ward of Farringdon Without; and the Fish Market, well known as Billingsgate, in the ward of Billingsgate. These four markets, in addition to the two live markets before mentioned, have absorbed and will absorb an amount of money to be reckoned by millions. The most prominent and best known of the latter four is the market first erected and called the Metropolitan Meat Market, to the details of which, with a few preliminary remarks, I now desire to ask your attention.

Smithfield, the site of the Metropolitan Meat and Poultry Market, appears to have been originally an open space of considerable but somewhat undefined extent. The name signifies a smooth plain, smith being a corruption of the Saxon word smeth (smooth). The uses to which in ancient times it was applied were extremely various. It appears to have been used as a place of execution for criminals at so early a period as 1219; a portion of it called the Elms, near to Turnmill Brook, being mentioned by old historians as the spot where offenders against the laws met their doom. Tournaments and jousts were held here on many occasions in the presence of the Plantagenet kings and their courts; whilst the citizens of London and their apprentices used it, as they did the neighbouring Moorfields, for archery and other athletic sports. The celebrated Bartholomew Fair, license for which was originally granted to the neighbouring priory of St. Bartholomew by King Henry II., was also held in Smithfield. Here also Wat Tyler at the head of the Kentish rebels met

Richard II, and his death at the hands of Sir William Walworth, Lord Mayor of London. But that which has obtained for the name of Smithfield a world-wide notoriety, was its use as a place for burning Protestant martyrs and heretics, the first instance of which took place in the reign of Henry IV. and the practice was continued in subsequent reigns, more especially in that of Mary.

Amidst all the various purposes indicated as above to which Smithfield was formerly applied, it yet appears to have been at the same time used as a market for the sale of horses and cattle as early as the year 1150; and the application of the site as a "live market" continued for seven centuries, long after all other uses had ceased. In 1614 it was, apparently for the first time, paved, drained, and railed in. Its extent had been much curtailed by the encroachment of streets and houses, until at this time it appears that it contained about three acres. This extent was enlarged at various times subsequently, until in 1847 it contained just six acres. About this time public opinion had been loudly expressed as to the nuisance of the market and the driving of cattle through the streets. The sanitary opinions of the day began to make themselves heard, declaring the existence of a large live cattle market with its concomitant evils and nests of slaughter houses and other trades in the centre of a city to be objectionable in the extreme, and in 1852 the Corporation obtained an Act of Parliament for the removal of the "live Cattle Market" to a more convenient and spacious site in Copenhagen Fields. This new Market at Islington, constructed by the Corporation, from the design and under the superintendence of my predecessor, the late J. B. Bunning, Esq., the architect to the Corporation, was opened by the late Prince Consort on the 13th June, 1855, under the name of the "Metropolitan Cattle Market."

Consideration was then given to the question of the appropriation of the site of Smithfield, thus left vacant. It was determined to build thereon a market for the sale of meat and poultry, the lower part or basement of which should form a railway depôt for goods, more especially meat or provisions brought to the market above. For this purpose, an Act of Parliament was obtained in 1860, and under its powers the present building has been erected. Another Act was obtained in 1861 for dismarketing Newgate Market, which had been established by Act of Parliament in 1670, in place of the shambles which had previously occupied Newgate Street. The date of the ceremony of opening the New Meat Market was, by the Act of Parliament of 1861, declared to be the period of the closing of the old one in Newgate Street. Under the powers of certain Acts the Corporation were authorized to raise large sums of money for the purchase of property, demolishing numbers of houses and other tenements, &c. The various railways, viz., the Metropolitan, and London, Chatham and Dover especially had not been idle, and from the confused mass of streets, alleys, &c., were the wide streets and larger spaces and sites of the new markets educed. The Plan marked † shews the old network of houses, streets, alleys, &c. The Plan marked †† shews the present sites and streets and the various railways running underneath the surface. The Corporation were further authorized to raise the sum of £200,000 for the erection of the Market building. The Act also fixed the rental at one penny per foot superficial per week for each shop; also a toll of one farthing on every 21 lbs. of meat, &c., brought into the Market, with powers, under certain conditions, to raise the toll to one farthing on every 14 lbs.

The carrying out of the work of the Metropolitan Meat Market as well as the Islington market previously alluded to, was confided by the Corporation to the Markets Improvement Committee, and their Chairman, Henry Lowman Taylor, Esq., J.P., who, having purchased and cleared the property before mentioned, set about obtaining designs for the proposed work. After much time and labour, and hearing and seeing various opinions and schemes, &c., they finally instructed me to prepare a design, which was approved of by them and submitted to and

adopted by the Court of Common Council in 1866. A reference to the plan on the wall shews that the site is a parallelogram 631 feet long from west to east and 246 feet from north to south. Dictated by circumstances and arrangements made in Parliament with surrounding owners and the representatives of various vested or supposed vested interests, a centre public roadway between 50 and 60 feet wide cuts the building into two halves. It must be borne in mind that the basement of this building is a railway station. Though at present used only for goods, yet the accommodation of staircases is provided, (as it was intended to accommodate passenger traffic to and from the market) as well as lifts for the speedy delivery of goods from the railway trucks into the market. The only carriage approach to the station is the circular road on the south side, lying between the Meat Market and St. Bartholomew's Hospital. The inner circular area, about one-third of an acre in extent, has been laid out and planted as a garden and pleasure grounds at the expense of the Corporation. In the centre is erected a handsome fountain designed by Mr. Butler, on whom it reflects much credit. A reference to the plan of the basement shews that the supports of the floor of the market are irregularly placed to suit the direction of the railway rails, and of course the circumstance of their irregularity occasioned some extra consideration as to the arrangement of the upper supports which carry the roof above the ground floor. These columns were originally intended to have been executed in cast iron: indeed two, at the north-west corner, were so executed by the Railway Company when they first ran their line of rails through the northern side of this basement, more than a year before any designs of the market were made, after which period the change of the construction from cast iron columns to wrought iron stanchions was made. The construction of this basement (of nearly four acres) with its retaining walls, supports, and ceiling or floor of market, was no small work in expense. It was the joint work of the Corporation and the two Railway Companies, viz., the Metropolitan and the Great Western, the design being the production of Mr. John Fowler, the Engineer to the Railway Companies, and myself, its execution being carried out under our joint superintendence.

It consists of a series of nearly regularly placed principal girders each about 240 feet long running from north to south, and having an average but very irregular bearing of a little more than 30 feet each, with the supports or stanchions as before stated placed so as to meet the necessities of the railway curves, &c. These carry numerous transverse girders running from east to west, 7 feet 6 apart, from which brick arches are turned. Roughly there are about five miles length of girders supported on one hundred and eighty stanchions, and altogether about three thousand tons of wrought iron.

About one-third of the area of the intended market was ready towards the beginning of May, 1867, and by that time the work of the market proper was commenced, covering an area of 155,226 feet. Certain postulates were arrived at: Imprimis—The market was to be an enclosed market, so that full command could be held as to the entrance to and exit from it, and as to the hours of opening and closing, &c., to secure the receipt of toll, examination of provisions or material sold, and other fit and proper supervision. Secondly, — Ample space in avenues and ready access to the surrounding streets.

After various diagrams had been prepared and submitted to and discussed by the Committee and the meat trade (wholesale butchers and salesmen) who met regularly, and in fact were formed into a powerful and compact body or guild, with secretary and other officers, and brought their views and supported them very strongly and effectively before the Committee, the Diagrams shown as the working Drawing No. 1, were adopted. You will see that the design consists of a number of equal parallelograms formed firstly by dividing the whole area in half by the central roadway, and

secondly by the central avenue which is 25 feet wide from west to east, giving four equal parts or quarters, each quarter having three avenues 74 feet long and 18 feet wide. Each of these minor blocks contain fourteen shops, about 36 feet deep, with a width of 15 feet,—the total number of shops being 162. These blocks of shops, formed partly by this central roadway, which was determined on in Parliament, so as not to lessen the means of access from the north of Clerkenwell to the City through Little Britain and King Edward Street, &c., and again by the central avenue running from east to west, and finally by the smaller avenues from north to south, form a disposition open to criticism. It will be seen that certain shops not only are corner shops, but situated in and fronting the leading avenue, and usually supposed to be more desired and desirable than those in the side avenues, thus not keeping all the tenants on the same footing. With regard to this especial point, to which I shall again refer, when I come to the Poultry Market, I must here remind you that prominence of position is of less consequence where the trade is nearly or entirely wholesale (as it is in this market), than equality in size and internal convenience; and these points are of more importance than show-room or publicity.

Having reference to a railway station below, with irregular supports to the floor of the market, controlled as before mentioned by the curves of the railway, and it being necessary to keep all the avenues clear of columns, of course the first problem to solve was the contrivance of the roof, its support, and the disposition of the columns on, the ground floor, so as to obtain their proper bearing on the stanchions in the basement. And here again come in more postulates. The roof of a market must, or rather ought to be, light, airy, and cool in summer, and whilst admitting light and air, it must keep out wet and cold in the winter. I have seen many markets, not only designs but actual buildings, covered with glass transmitting direct rays, more like cucumber frames, or say crystal palaces, than the cool, shady, but airy retreat in hot weather that a market should be; and again others built or designed with shed roofs, apparently for the purpose of shutting out all the light and admitting, through large unprotected openings, wind, snow, and sleet, which of an early winter morning must be trying to salesmen and frequenters of the market. In nearly all the Metropolitan Markets the same principle has been employed in the roofs throughout, and I do not know that I could more correctly name it than by calling it an adaptation of the mansard principle, with certain alterations suggested by circumstances and by the difference of the situations and the various spans of the different roofs. The working drawings show various sorts of roofs, the principle of construction being a tall sloping side at an angle of about 65 degrees, and for every 30 feet span 8 to 10 feet high, supporting an ordinary trussed King post and rod, or, for longer spans, a Queen post roof, the mansard side or sloping portion being well secured by knees to the upper truss. On these knees being well secured and executed depends to no small extent the efficiency of the roof and of its resting on the upright supports without any material lateral thrust. The sloping sides are filled in with glass Louvres, some 7 or 8 inches apart, and sloping at an angle of 41 degrees, so that there are always two thicknesses of glass for any sun ray to penetrate, stopping the heating ray from passing through the second glass, and thus, even if the sun is hot, inducing a current of air to pass between the Louvres and to pass out on the other side where it is in shade. In many cases small dormers are added to the upper trusses, giving additional currents of air, light, &c. The roof of the long central avenue is with a continuous plate, ample rigidity being afforded to it by the other roofs on each side. In fact, the whole arrangement of roofs is a series of square elongated domes with but small lateral thrusts, and their accumulated weight is ample to prevent any danger from wind. In addition to their weight and the resistance to gales they afford, the four corner towers must naturally assist to retain in solidity the whole erection. Pardon me if I have dwelt somewhat at

length on the question of the covering, but I felt that it was an attempt to solve the problem as to light, air, and protection from weather; and unless this had been solved to the satisfaction of the wholesale butchers and salesmen in the meat trade before alluded to, not one would have moved in 1868 from their holdings in Newgate and other markets. The moving of a market is always an operation of great risk and uncertainty.

Having exhausted your patience with the roof, I must ask you to turn your attention to the detail of the shops. As you may perceive they average about 36 feet by 15, consisting on ground floor of shop or selling space, counting house, with scale room or beam, and small staircase to upper floor. This upper floor contains a small room, in no case for sleeping, but for retirement, meals, &c., averaging about 180 feet superficial, lavatory and W. C. The height of story being fixed at about 13 feet from floor to ceiling, some economy in space was gained, especially on the ground floor, by constructing an interlacing stair, by which the tenants of two shops would be enabled to ascend to the upper floors in the space occupied usually by $1\frac{1}{2}$ stairs, or $\frac{3}{4}$ each, a saving in fact of 25 per cent. on each staircase. A model to scale is before you: it saves on each floor at least 18 feet, or by the mode of charging rent, gives an advantage of 18 feet at 2d. per foot (1d. on each floor) per week = 3s., or £7. 6s. per annum on each shop—or say £1182. 12s., a nice little sum at twenty years purchase. Of course there are many details which in a brief notice of this description must be omitted, though they necessarily involved special consideration:—for instance, not only the provision for carrying away the water of roofs, but also the closets, lavatories, &c., the thickness of the floor between station and market being limited, and the level or floor of station being considerably below the general level of the surrounding sewers.

The style of architecture adopted for the Market Building is that generally understood by the term Italian, but of a type more nearly allied to the Renaissance architecture of France than the more severe Palladian school. The prevailing feature is a series of arcaded recesses between Doric pilasters, fluted on the upper two-thirds and elevated on pedestals. The entablature is returned and ornamented over the pilasters and finished with ornamental vase-like terminations, which recurring at regular spaces through the length of the building, give an effective sky-line. The general height of the external wall is 32 feet. Between the Portland stone pilasters the recess is built in red brickwork, which, by its contrast of colour, gives point to the architectural effect and adds greatly to the appearance of the whole. The semicircular head of the arcade is filled in with iron scroll-work, so designed as to occupy the space, and yet leave room for air and light to pass freely through, there being no glass behind. The keystones of the arches are carved, those over the twelve side entrances being carved into heads, the others into shields. The windows under these openings have stone sills and trusses, architraves, and cornices, and are also filled in with ironwork, but of a less ornamental character than that in the arched head above.

The chief points of architectural effect are the four towers, the frontispieces, or façades of the public roadway which passes through the Market from north to south, and the pedimented gateways to the east and west fronts. A long line of enclosing walls only 32 feet high was the problem to be solved. The four towers which mark the angles of the building, are in the only positions where it was possible to raise superstructures of any great importance within the general line of the walls. These, however, are most valuable, as marking the extent of the façades, and keeping up, as it were, the unity of the design. They are entirely of Portland stone, the brickwork being omitted in the lower arcades, and a large window filling up each arcaded recess. The lower story or vertical compartment is square, with double pilasters at the angles, and a carved pediment on each face. Above this height the towers are octagonal. The junction between the square and

octagonal portions, always a difficult architectural problem, is here attempted to be solved by introducing boldly cut griffins (the supporters of the City Arms) in a couchant position. The octagonal part above has windows on each face with carved friezes, and over each is a circular window, the opening forming the eye of a boldly cut shell-like ornament. The dome which crowns each tower is pierced on four sides by dormer windows, and above is a "lantern" surrounded by an ornamental iron railing. The roofs of the domes and lanterns are covered with copper, cut into the form of leaves, which overlap each other like slates.

The covered roadway, which divides the Market into two equal parts, was as before stated, an absolute necessity, or at least a compromise under the Act of Parliament, and supplies a feature of sufficient interest to mark the centre of the building, while it prevents the long length of the north and south fronts from being monotonous. The roadway is 50 feet wide between the double piers at the entrances, which carry a richly moulded elliptical arch and pediment of cast iron. Over each double pier is an emblematical figure, sculptured in Portland stone, representing one of the four principal cities of the United Kingdom; those on the south front represent London and Edinburgh, and those on the north front Dublin and Liverpool. The sides of the roadway are shut off from the Market by a screen of open ironwork 14 feet high, and at the intersections with the central avenue, which runs east and west, the Market is closed by gates of ornamental ironwork, having enriched iron spandrils and semi-circular heads, similar to those on the arcades outside. Towards the north end of the roadway, and on the east side, another gate gives access by double staircases to the Railway Department below, and near this the Market Officers' Rooms are placed.

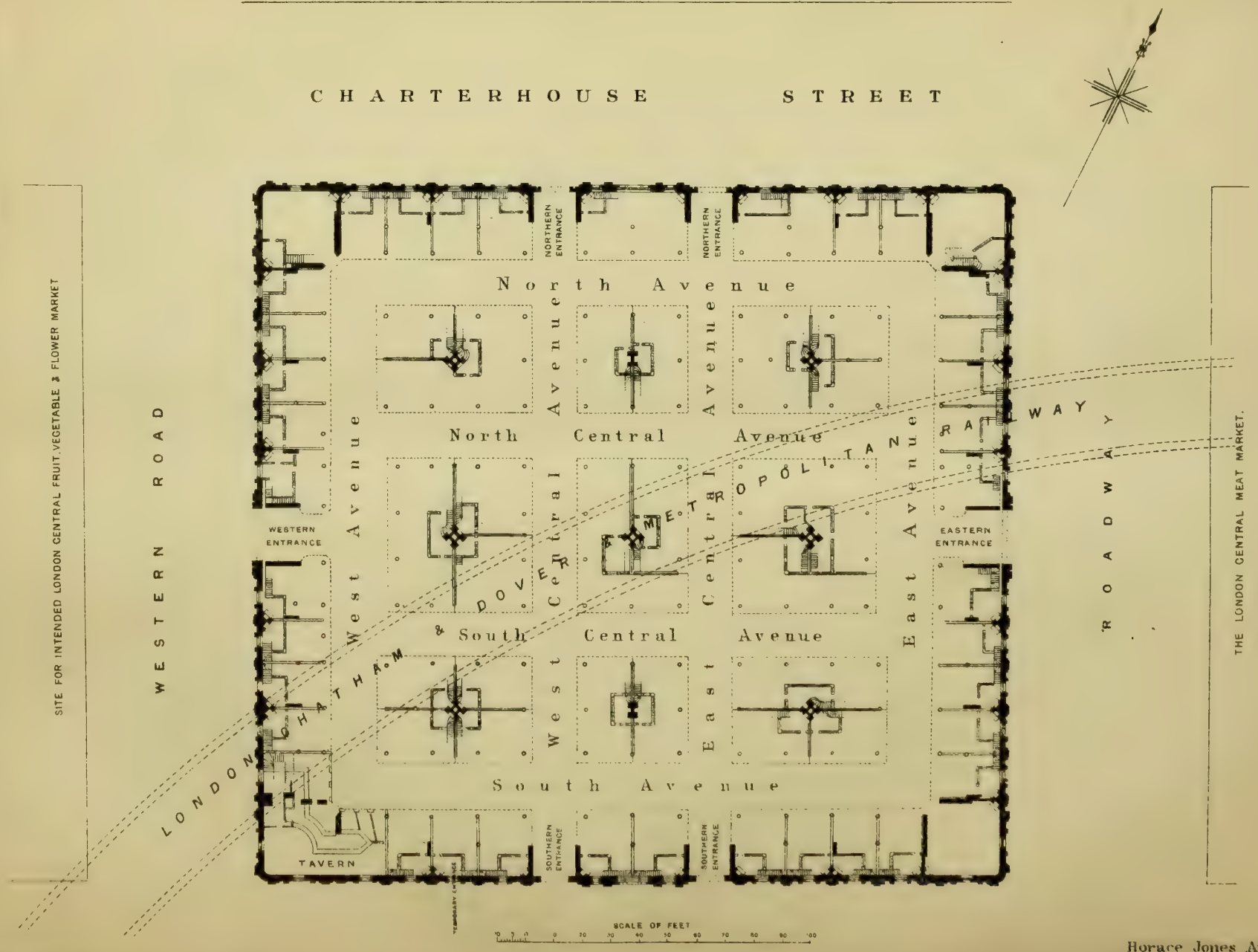
The gateways at the east and west ends of the building to some extent resemble the frontispieces at the ends of the roadway on the north and south sides; they form the central features, and by their importance mark the chief entrances to the Market. The opening of these is 27 feet by 19 feet in width, surmounted by an elliptical pediment with the City Arms boldly cut in the tympanum. The gates at these entrances are of great size, and though made of as light construction as is consistent with strength, they weigh 15 tons a pair; the dimensions are 25 feet by 19 feet. The twelve side entrance gates are also of considerable size and of similar design.

Some facts as to the quantity of provisions supplied to the market may be interesting. Nearly 190,000 tons of meat were supplied last year; enough, indeed, to afford $4\frac{1}{2}$ ozs. of meat daily to four millions of mouths. No doubt a large quantity of this goes far beyond the metropolis, and at times to centres of population in the north, the midland and the south—making this market as a provision and meat market, not merely a metropolitan market, but really and truly an Imperial market—fixing and defining the prices of meat from Aberdeen to Cornwall. It may also be interesting to learn that the annual receipts, as shown by the published reports, are between £50,000 and £60,000, and after allowing duly for repairs, collection and every expense, there remains a large balance for interest of money and extinction of debt, and remuneration for capital invested.

What the present rate of loss in rental is I am not prepared to say, but I recollect for some five years the average loss was between 10s. and 12s. per annum on the entire rental.

The western approach street (from Farringdon Road to the north side of the market) required by the original act, but constructed under the powers of a separate act of parliament, was an important work, and involved much labour in excavating for and forming a sewer and vaults under the Metropolitan Railway. A bridge over the railway also had to be constructed, the work to which was only performed during two or three hours in each night, or rather early morning (from one to four o'clock), to avoid the risk of accidents to passing trains, as the traffic of the railway was uninterrupted. The work was completed and opened in 1867.

LONDON CENTRAL POULTRY & PROVISION MARKET.



Horace Jones Archt.

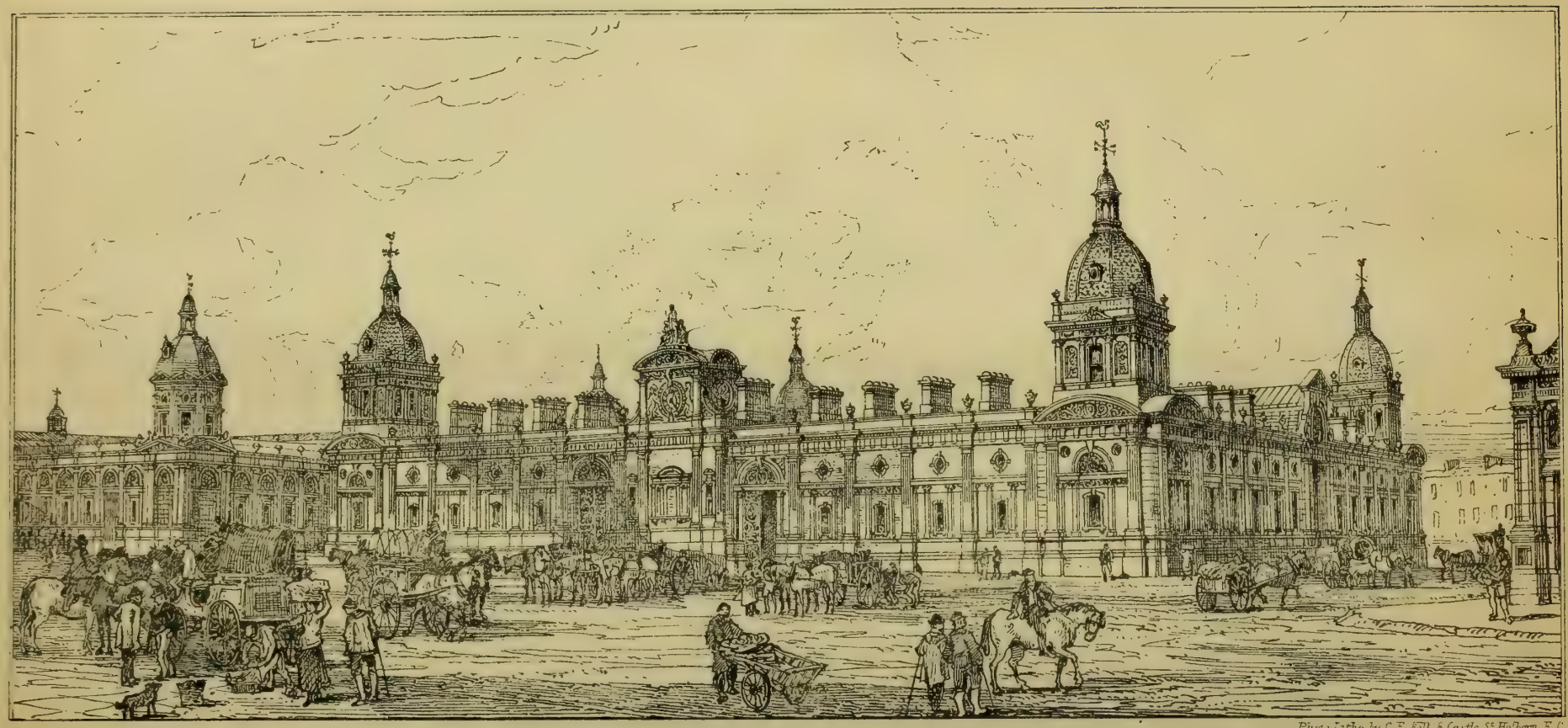


Photo-Litho by C. F. Kell 6 Castle St. Holborn. E. C.

THE LONDON CENTRAL POULTRY & PROVISION MARKET.

Soon after the opening of the Meat Market, in November 1868, it was found that the requirements of the trade completely exhausted the space at the command of the Committee to whom the management of this market was intrusted, and they determined to recommend the proposition to remove the poultry trade, which at first occupied the eastern end, erecting for the poultry and provision trade a new market, and accommodating the butchers and salesmen (otherwise the meat trade) with the entirety of this market lately (in 1868) opened. In 1872, the Markets Improvement Committee presented a report to the Common Council recommending the construction of

THE NEW LONDON CENTRAL POULTRY AND PROVISION MARKET, SMITHFIELD.

The new building in design and treatment is similar in its general features to the adjoining Meat Market. This was rendered necessary, not only by its being used for a cognate purpose, but also by its close proximity to the present structure, with which it was necessary that it should harmonize in appearance as well as in purpose. The Doric in both buildings is the governing order, but, instead of the series of arcaded recesses, the bays or compartments between the large pilasters are divided into two storeys by a sub-order of more delicate design, over which in each case is an oval window, affording light and ventilation to the rooms above the shops.

The chief points of architectural effect in the external design are the four pavilions at the corners of the building,—the centre or clock towers on the north and south fronts, and the east and west entrance gateways. The four pavilions mark the extent of the façade, and were originally designed to contrast with those of the Meat Market, and it was only at the strongly expressed wish of the Committee that they were re-designed to be more in accordance with the adjoining building, and the drawings of them speak for themselves. The clock towers which mark the centres of the northern and southern façades, where are double entrances to be referred to directly, are carried up above the general line of cornice, with pilasters and a pedimented cornice on each elevation, the space between the pilasters being occupied by a clock surrounded by a carved stone setting, of an ornate character, representing the supporters of the Arms of the Butchers' and Poulterers' Companies. The entrance gateways at the east and west have also been altered from my design to be only mere copies of those of the Meat Market, although the portals are filled in with ornamental cast iron work of a different design.

The interior of the building is in every way subservient to utility and the wants of the trade, but even here it is lighter and more airy than its predecessor. The roof is formed by means of semi-circular ribs, the avenue roofs affording somewhat similar vistas to those obtained by the lines of the central and other avenues of the meat market.

Abundant light is diffused throughout the building from the roofs, constructed on the glazed louvre principle, which has been found so effective both for purposes of lighting and ventilating,—instances having occurred in which the temperature of these buildings has been, on a hot day, thirteen degrees less than in the shade outside. The means adopted in this building have improved, if possible, the effect obtained in the other, and at the same time prevented the ingress of some snow, rain and cold in severe winter weather, which had in some instances found their way into the former building between the louvre glass.

The avenues—21 feet 6 inches wide from centre to centre of columns—are eight in number, four running north and south, and four east and west. This arrangement divides the interior into blocks, each containing four shops. The total number of shops, exclusive of the corner pavilions, is seventy-two, and the area of each shop ranges from 380 to 700 feet.

It is well here to call your attention to a point alluded to in my remarks about the Metropolitan Meat Market, and to its plan, with reference to its possessing corner shops, and the fact that they might be, in many instances, supposed to be more desirable or more valuable than those in the middle of an avenue. Though this theory was, to some extent, mitigated in the opinion of the wholesale dealers, especially if the benefit of window or outward show were to be excluded, yet it did form, to some extent, at times, a cause of jealousy and dispute. In this plan, therefore, the Committee determined so to arrange the avenues, or blocks of shops, as to make all central shops angle shops, whilst the contiguity to entrance, or being placed directly at the end of an avenue, or other causes, rendered the other shops of an equal value, or at least equally sought after, having regard to size and other accommodations.

A great advantage which this Market possesses over the Meat Market, is the commodious cellarage under and devoted to each shop; besides which, a long series of vaulted and groined brick cellars, averaging 14 feet in height, occupy the basement of the avenues. These can be entered from any of the pavilions,—from the roads east and west of this Market,—from the intended Vegetable Market, and from King Street, Snow Hill.

The westerly block of land on plan is for the Vegetable Market, separated from the Poultry Market by the road, 60 feet wide. It is not yet so far settled in design as to be produced before you to-night; but the intention of the Corporation to proceed is evinced by the circumstance that land has been taken, and excavation, retaining wall, &c., executed to a very large amount. Accommodation for the comfort and convenience of the public, as well as a depositing place for condemned meat has been provided at the triangular space at the south-west of the Poultry Market; and, as the road to the basement from Snow Hill passes below this erection, any unwholesome meat or nuisance can be removed without contact with the public.

BILLINGSGATE.

Long ere London was, a small stream or brook ran down from the higher land, forming a creek or estuary, valuable as a landing-place or harbour for the small craft and boats of the early inhabitants. As far back as the Saxon kings, we know that tolls and charges were levied on the small shipping of those days bringing fish and other produce to London, and landing at Belingsgate, or Billingsgate, as it now is called. Gradually the convenience of the site, and the proximity to the centre of the ancient London rendered this small harbour, or gate, extremely well frequented, especially by the fishing-boats of the period, and in due time the fish trade drove out other produce.

The increase of London, both in size and wealth, rendered this trade of great importance, and the Fish Market of this City was then established. Until 1846 it consisted only of shed buildings, round the reduced site of this creek, or estuary, which from a harbour was reduced, by wharfing and quay works, to the old remembered Billingsgate Dock, round which clustered the shed buildings that served the salesmen and fishmongers for the purposes of carrying on their trade.

At the before named period, the Corporation determined to improve the Market, and Mr. J. B. Bunning, their architect, prepared drawings, and subsequently executed the, at the time, commodious buildings, with the pleasing Italian façade which you may all recollect.

The rapid growth of London, the importance of the trade in this valuable article of food, and the desire of benefiting, not only salesmen and fishmongers, and carriers both by sea and land, but also the public at large, induced the Corporation of London, about five or six years ago, to apply to Parliament and obtain powers to rebuild on a larger scale this Market, the Act for which was granted in 1872.

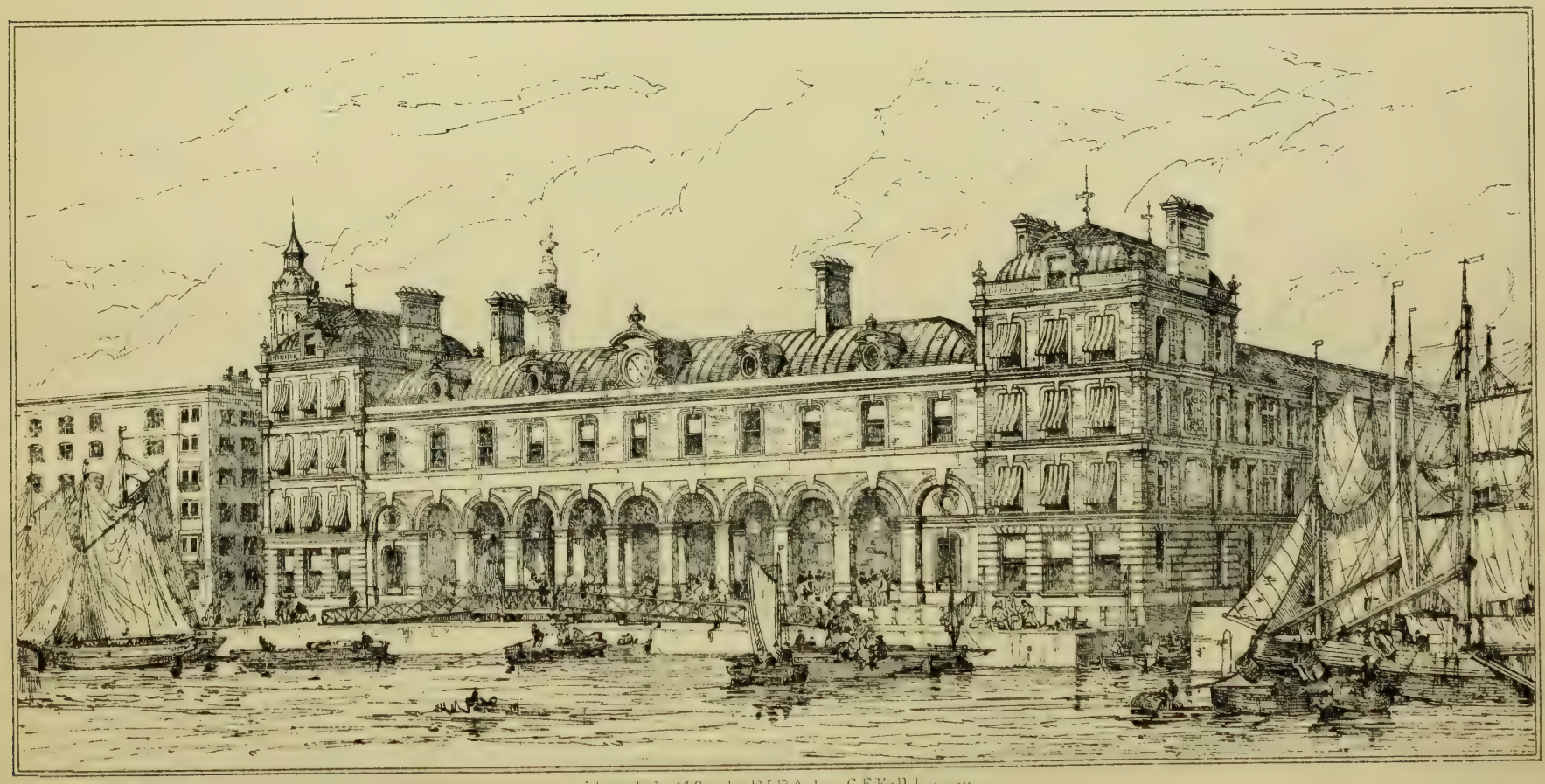


Photo Lithog.ᵈ for the R.I.B.A. by C.F. Kell, London

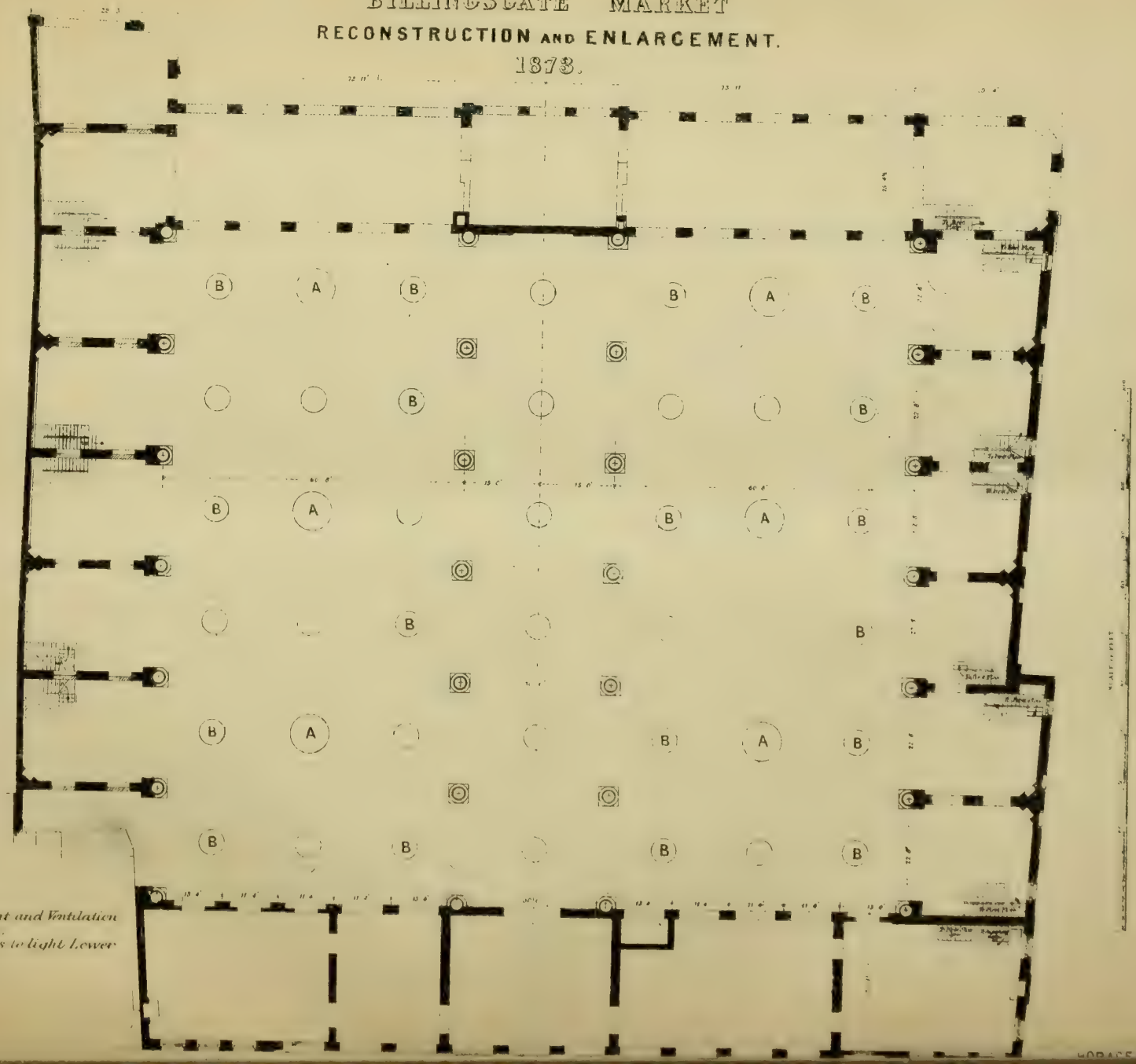
BILLINGSGATE MARKET RECONSTRUCTION AND ENLARGEMENT.

HORACE JONES.
Archᵗ.

BILLINGSGATE MARKET

RECONSTRUCTION AND ENLARGEMENT.

1878.



NOTE. A. *Openings for light and Ventilation to Lower Market.*
B. *Prismatic glass to light Lower Market.*

HORACE JONES

The site was still much circumscribed by the Custom House on the east, and owners of the large and valuable wharves, &c., on the west; but, by absorbing the old site of Darkhouse Lane and Billingsgate Stairs, &c., a spacious plot of land between Thames Street and the River has been obtained.

The total area of the new market on the level of Thames Street is 39,000 as against 20,000 feet of the former market. From the peculiarities and nature of the site, being the bed of the estuary or creek before alluded to, it has been necessary to excavate the soil, a mingled mass of piling, river mud, cesspools, and refuse of all kinds, to a depth varying from 15 feet to 50 feet below the level of Thames Street. The underpinning of adjoining walls, in some instances to the depth of fifty feet, or twenty-four feet below low-water mark, in this porous soil, subject to the flux and efflux of the tide, and the necessity when below low-water mark of continuous work and pumping, was for nearly six months a work of great anxiety and expense. Warned by the lamentable fate which befell the adjoining public buildings some fifty years ago, sound and completely substantial foundations were executed, and the Corporation availed themselves of the increased depth of excavation to construct a lofty, airy and fairly lighted basement, about 24 feet high, which will also be available not only for a shell-fishmarket, but for other market purposes, should overcrowding on the level of Thames Street render it necessary or desirable.

The accommodation provided is as follows:—The basement has an area of about 20,000 superficial feet. It has a groined, vaulted and domed roof, supported on piers affording a total height of 24 feet (and a span of 17 feet 4 inches in clear, the centre span being 24 feet): large circular apertures, partly glazed and partly open, are formed in this roof for light and ventilation. The basement is approached on the north side (Thames Street), and south side (the river quay), by wide and commodious staircases, with a lift about 10 feet 6 in. by 4 feet 9 in. to each staircase. There are also double floors for the river side taverns, and for the fourteen shops or warehouses on the east and west sides of the market; the portion under the arcade, next Thames Street, is devoted to engines, boilers, steam generators, and for pumping, working lifts, supplying hot water, boiling shell-fish, &c.

On the ground floor, the whole area of the market is just about 39,000 feet. The interior area, exclusive of shops, taverns and arcade, is covered with roofs, on the louvre glass principle, carried on lattice girders of 60 feet span, affording ample light and ventilation to the general market. The height from floor to roof is 31 feet 6 inches at the plate, and 43 feet at the ridge; and this area, with arcades, is about 25,000 feet.

The gallery called the haddock market is 30 feet in width, running from north to south above the general market. It is approached from the staircase halls, which serve for access to the basement and ground floors, and has an area of some 4000 feet; and, as its name implies, is a market for the sale of haddocks and other dried fish, a considerable traffic in which article is carried on at this market. The lighting and ventilating this part of the building is similar in every way to that of the general market, and somewhat similar to the principle adopted in the markets at Smithfield.

The heavy goods, barrels, &c., for the upper and lower markets of this building will be conveyed from the ground floor by means of the hydraulic lifts, which will be fitted up near Thames Street, to take the land traffic, and next the river to accommodate goods brought by water. Boiling places, supply of steam, &c., are, as before alluded to, provided for cooking lobsters, crabs, and other shell-fish of their different kinds, so that the entire fish business will find its centre in the new market.

The design of the building is Italian in character, and the materials used in its construction

are Portland stone, with polished grey granite plinths and wall linings, the intervals between the archivolts and windows being filled in with yellow brick facings. The front next Thames Street consists of an arcade, terminated at its eastern and western extremities by pavilion buildings, and a pedimented central feature, marking the entrance to the shell-fish and dried fish markets. The river front is similar in general treatment, but differing in detail, and includes two large taverns, situated at its south-east and south-west extremities, on the upper rooms of which, no doubt, will be continued the fish dinners which have been so long a part of Billingsgate life. The revenue of this market has, I am pleased to say, increased since its extension—so as to fully justify all that has been expended on it.

In conclusion I would ask your attention to one or two facts that may be perhaps novel to you and the public in general. The first is, that no one knows, or seems to care to know how much the four millions of people composing this metropolis are indebted to the chartered Lords of the markets of London, "and seven miles round it"; these Lords being The Lord Mayor and Corporation of the City of London, and without the care and expenditure undertaken by them, it is difficult to estimate how much the inhabitants of London would suffer from an inferior supply of provisions, and from higher prices than are now paid, for prices would be raised by monopoly, and increased by combination.

These four Markets, with their accessories, involve an expenditure before completion approaching £ 2,000,000, have all been designed since 1866, and including the two large outlying ones, viz. Islington and Deptford, of nearly three millions of money, raised on the credit of, or supplied by the Corporation of London; so that, whilst no necessary expense is spared, due economy was necessary, and it must reflect no little credit on the business talents and capabilities of the Committees and their Chairmen entrusted with the carrying out, and also with the constant supervision and maintenance of the Markets; and though, of course, the gratitude of the public is not likely to be shewn or expected, yet it is well to let them know to whom they are indebted.

I have now no time to say more, and I feel that what I have said is little more than a preface of a full description of the Metropolitan Markets, and I should be only too pleased at some future time to supplement what I have begun.

I would further here avail myself of this public opportunity to express my thanks for the courtesy I have received from the Chairmen of the various Market Committees and Sub-Committees during the last dozen years, during which time the question of Markets has formed a portion only of my labours under the Corporation, and thanking you, Mr. President and Gentlemen, for your patience and attention during this evening, I beg to apologize for trespassing so long on both.

A vote of thanks having been passed to Mr. HORACE JONES for his Paper, the Meeting adjourned until Monday, the 21st of January, when the Paper will be discussed.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday, January 21, 1878, Mr. JOHN WHICHCORD, F.S.A., Vice-President, in the Chair, the following business took place:—

DISCUSSION ON MR. HORACE JONES' PAPER—ON THE NEW METROPOLITAN MARKETS.

THE CHAIRMAN having invited discussion on Mr. Horace Jones' Paper on the "New Metropolitan Markets,"

MR. J. D. MATHEWS, Fellow, said—Having given some little attention to markets, and knowing some of the markets described in the Paper, I have pleasure in offering a few remarks. In designing the Metropolitan Meat Market one of the chief points to be considered was the mode of lighting and ventilating—as in a market of this description considerable difficulties were in the way, but I think the result has been exceedingly satisfactory, considering the enormous amount of traffic in the market, and the length of time that the market is held by gas light. When I have sometimes had occasion to pass through it in the middle of the day, I have noticed the air has been particularly good, and that is saying a great deal for a meat market. I think no better testimony to the success of the market can be given than the way in which it has been taken up by the meat trade. The fact of a market which had been used for so many years being done away with, and the enormous interests at stake, created a considerable amount of prejudice against the transference of the trade to the new market, but that has pretty well terminated, and I think the market altogether must be pronounced a success. With regard to Billingsgate, now that the new market is erected, the question of approaches will have to be seriously considered; for no position could be worse in that respect, although the necessities of the case were such that its removal could not be entertained. At the same time the increased traffic brought to that place must of necessity considerably increase the traffic in the streets in that neighbourhood, and Thames Street is especially one that should be widened, not only on account of the market but the various large traders in that vicinity, as it affords direct access to the west and north and south-west of the metropolis. With reference to the vegetable markets, a question occurs to me which has no doubt received consideration, viz:—the desirability of concentrating the whole of the meat, poultry and vegetable markets in one place. Those who have seen these markets in full operation must have been struck with the enormous number of waggons and carts for the conveyance of the commodities that assemble in those neighbourhoods, and it appears to me that when the three markets are brought together the standing accommodation for the vehicles will be put to a severe test, as the further a cart is from the market the greater will be the porterage. The present Farringdon Market is I think in a good position in that respect, Farringdon Street being a fine wide street. On the other hand the site proposed has many advantages which the present site has not.

Mr. E. WOODTHORPE, Fellow.—I do not apprehend that this Paper affords much matter for discussion. The subject has had full consideration by a powerful body of men who are thoroughly conversant with it as men of business, and I congratulate my friend Horace Jones on his successful

accomplishment of a very difficult task. The prejudices to be overcome were very considerable (the Corporate power over him being very great); and I think under all the circumstances of the case our friend is deserving of the highest congratulation for what he has accomplished. Few can know the difficulties to be overcome. Personally I can readily appreciate them, inasmuch as it has been my lot to construct markets in the country, which however, when compared with London, sink into insignificance, considering that the Metropolitan Markets are the great depôts for the supply of the great staple foods to over three millions of inhabitants.

Mr. THOMAS RUDKIN, Visitor.—I felt when this Paper was placed in my hands, and I had read it through, that it was more a question for architects than for those who have to deal simply with the food supply of London. It is a matter of indifference to those who have to deal with that, as to the architectural effect produced, although we are all admirers of architectural effect and desire to give every facility to carry out that which is necessary with the view of beautifying our streets and improving our edifices in this great metropolis. But at the same time we had to view the question practically to provide in the first place extensive markets with adequate approaches, sufficiently large and commodious, and that the shops and stands should be such as would meet the requirements of the trade and the communities who visit them. Therefore when I read this Paper, it occurred to me that I should be out of place in offering any remarks upon it, because I may say my experience and knowledge of the question rather goes to that part which affects the supply, the sources from whence it comes, the mode in which it is distributed, and the results generally, than the fact that our friend has had the opportunity of constructing three or four very excellent and magnificent markets in the City of London. But I may say, if you will forgive me for going a little into the question, I do think the question which the gentleman behind me referred to, viz., Billingsgate Market and the approaches thereto, is one of considerable importance. I was one who took a strong view five or six years ago that the time had arrived when it was desirable to remove Billingsgate Market from the water side, and I suggested it should be located in the immediate neighbourhood of the new meat market, a little distance from Farringdon Road. That was in view of the possibility of fish coming into London by railway instead of by water. I believe another twenty years will see that accomplished: every year less fish comes by water and more comes by rail, and we shall have fish from all the ports whence it was sent brought by the early morning trains and delivered in time for the market. Fish landed at Yarmouth or Grimsby at 5 o'clock in the afternoon may be delivered in London before 5 o'clock the next morning, and sold from the railway trucks, in a market specially constructed for that purpose. I believe many of us will live to see that, and it will be a great boon to the public. We shall then get rid of the crowded traffic in the immediate neighbourhood of Billingsgate. There are, as you know, two or three large trades mixed up together in that locality:—there is the Mincing Lane trade, the foreign fruit trade, which has now assumed large dimensions, and the fish trade, all centered in that district, and it is impossible for it to have the amount of pressure upon it. One of the trades at least must be removed; there is not sufficient space in that locality for the three extensive trades to co-exist in the same place. With regard to Farringdon Market, the question of street accommodation will have to be met. The concentration of markets in a particular locality must be looked at with reference to facilities of traffic. We must not attempt to perpetuate the evils of old Newgate Market, which there will be danger of doing in concentrating large markets together, unless there are means of direct railway communication for the ingress and egress of the commodities. I believe railway communication will greatly prevent the block of traffic in the streets, and the result must be that in a few years hence a large per centage—at least 75 per cent.—of the whole of the food—meat, poultry, fish and vegetables,

including potatoes will be brought into London by direct railway communication with the markets. That would be a great advantage. We should get rid of the enormous street traffic in reference to that particular supply, and it will be the means of bringing those who have to sell, and those who desire to purchase, to the markets by direct railway communication. But there is another question which I am much interested in, and that is the question of the live cattle trade. The live cattle trade has been referred to in the Paper with regard to the Metropolitan Cattle Market and the market at Deptford. Those two markets have been under a cloud since 1865-66, in consequence of the cattle plague. We have had an enormous difficulty to make them successful, or even to bring things to bear to enable the traders to carry on their business. I believe now by the common sense prevailing, we shall get an Act passed in the present Session under which all foreign animals coming to London will be landed and slaughtered at Deptford, and thence conveyed not only to the interior of London, but by railway to all the districts of England; and if we in London can and do obtain 190,000 tons of meat every year, slaughtered in every part of the three Kingdoms, there is no reason why the people in the country cannot be supplied with food from the animals that may be slaughtered in London. I believe if it had not been for the existence of the foreign live cattle market at Deptford during the last three years, we should have lost the supply of the whole of the animals slaughtered there; because if the market had not been in existence, Government might have stopped the landing of animals from all places where there was suspicion of infection. Copenhagen Market, as a great centre of supply of English meat, I am afraid is going down, and I am one of those who think the decadence of that market will not be unattended with public benefit, for I believe the more largely animals are slaughtered at the places where they are bred and fed, the greater will be the weight of meat, and the better the quality of meat, the public will obtain, whilst it will tend to the abolition of many of the great London slaughter houses, some of which are not fit for people to enter; but if the animals were slaughtered where they are bred and fed, there would be a larger quantity of food supply for the London market. It is calculated that animals slaughtered at Aberdeen would weigh at least six stone more than if they were sent to London alive by railway or steamers. In other words the waste amounts to a loss of 30s. or 35s. per bullock. They seem to feed upon the fat they have in them, and the result is a great loss of weight of food, and you can understand what the deterioration of a staple article of food must be under such circumstances.

Mr. Boulnois.—Was there any provision for American meat in the arrangements of the market?

Mr. Rudkin.—We consider that we have sufficient accommodation for any large quantity of meat that may come from America. I believe the advent of the American meat trade has been an enormous boon not only to the trade but to the public. The great bulk of the supply is of the very finest description of meat, and for the most part is received here in excellent condition, and I dare say gentlemen residing at the West-end frequently eat American beef, thinking it to be Aberdeen. It is almost impossible to know the difference. It is as fine as can be, although a large quantity of inferior meat comes as well.

Mr. Ewan Christian, Fellow.—There is one gentleman whose name has not been mentioned in reference to the supply of meat to London: that is the late Mr. Charles Pearson. There may be some gentlemen here who were invited to meet at his house in Westminster several years ago to hear an account of his scheme for bringing together all the supplies of meat for this great metropolis. I was myself exceedingly struck with the excellence of his scheme. I thought at the time it was the best thing that could be done for the supply of London, and anything I have heard about this matter makes me think that Mr. Pearson was really the precursor of all the improvements

that have taken place. He took great pains to explain by models and drawings what his proposals were: a prominent feature of his scheme being that all meat brought into London should be slaughtered many miles away, brought direct into the market by railway, and there sold and distributed to the dealers. The extreme simplicity of Mr. Pearson's plan struck me very forcibly at the time, and I have never forgotten it. All that has been done by the city since appears to me to have been founded on that scheme, and Mr. Pearson's share in it ought not I think to be lost sight of.

Mr. WOODTHORPE.—I apologize for rising again, but I have a full knowledge of the circumstances which Mr. Christian has referred to from having been engaged at the time with a most able man—John Stevens. It was he who being a skilled draftsman made all the drawings under Mr. Pearson's guidance, and who also constructed the models illustrating that gentleman's ideas, and to that extent great merit was due to my friend John Stevens.

THE CHAIRMAN.—I think we are travelling a little out of the legitimate discussion of this Paper, and there may be gentlemen present who have some remarks to make upon some of the novelties of construction which have been brought to our notice, which is more an architectural view of the subject than has hitherto been taken.

MR. C. FOWLER, Fellow.—Having devoted some attention to the subject of markets, I have been much interested in the construction of these buildings. The principle of construction Mr. Horace Jones has adopted quite accords with my own views. We all know more or less the construction of some of the spacious markets in various cities on the continent—more particularly in Paris. The design of the *Halles Centrales* is on a grand scale and well carried out, but I think in some respects it starts from a wrong basis: and I agree with Mr. Horace Jones in starting with a different idea in two important respects—one being as to material of construction, and the other as to plan. With regard to materials, I have always thought—and I know my father who constructed several large markets was of the same opinion—that iron is not the best material for the roof of a market. There should be walls of brick and the roof mainly of wood, a non-conducting material with no more glass than is required for the proper lighting of the market. This applies more particularly to a meat market, where it is essential to keep the temperature as even as possible, and more particularly not too high. It appears that our friend has succeeded in carrying out that object. Although an ordinary observer may be struck with the spacious appearance of the *Halles*, and may regard it as grander than anything we have here, yet a practical or professional visitor would say that Smithfield rather than the Paris Market is the right thing. A most important consideration in a market is its situation: that of the Metropolitan Meat and Poultry Markets is exceedingly good, and the Corporation were well advised to occupy the ground which they had in that manner. It is extremely important to have access on all sides, and more particularly by railway if practicable, as in this case. As to exterior, I think our friend has succeeded in giving his buildings a sufficient elevation without sacrificing too much to appearance. Great height is useless in a market, and in the *Halles Centrales* economy is sacrificed to producing useless height. One word as to the arrangement of place. Of course these markets as Mr. Horace Jones mentioned are not merely metropolitan, but to a great extent imperial. They are only to a small extent retail markets, but principally wholesale: therefore the arrangement of them is made with reference to that fact. The arrangement of the stalls in a market is a very important point which is too often over looked. If you go through many of the large markets in provincial cities, you cannot help being struck with the utter want of consideration of that most vital point. The general mode is to place stalls along a central passage with crossways only at intervals, and perhaps rows of shops at the sides; but those who have studied the subject more than I have,

know that is not by any means the only requisite arrangement. In the matters of the details of stall arrangement I think our foreign neighbours surpass us. The plan and construction of their stalls are very well studied, and particularly so in the *Halles Centrales*, the chief business in which is of a retail description; but besides that they devote a great deal of pains and trouble to the details of setting out their wares to the best advantage. The result is that the whole market bears a fresher and more inviting appearance than our markets do. There is scarcely a market in London that looks inviting, yet the trade transacted in them is enormous, and, being chiefly wholesale, there is no occasion to make them pretty. In the matter of tasteful display of wares we may no doubt learn a good deal from our continental neighbours. I join very cordially in thanking our friend for bringing so interesting a matter before us.

The CHAIRMAN.—I had rather hoped we might have had a little more professional talk upon this interesting subject. I shall intervene but a few moments between the observations that have been made and any further remarks which Mr. Horace Jones may think proper to make. We have had sent up to us, no doubt in consequence of the notices that were given in the professional journals of the Paper read a fortnight ago, a communication from the Architectural Society of Manchester, in which numerous statistics are given which may be interesting to those who study this question, and especially to Mr. Horace Jones. The summary of the statistics gives the areas within the municipal boundary of Manchester at 4294 statute acres: the estimated population in 1877, 359,213: and the rateable value of property, £2,229,186. Making a few calculations from these figures, shows that 48,500 square yards meet the purposes of markets for live and dead meat and other provisions. It therefore follows that a yard of market space is given to each eight persons of the population: that 11½ yards of market space are given to each inhabited acre, and that the cost of the markets per head of population is a fraction above £6. This appears to me to be an interesting communication from the Manchester Society, and evidences the interest our Northern brethren take in the subject and in our proceedings here, and it will probably induce Mr. Horace Jones to make comparisons of those figures with the larger area and population of the Metropolis. With regard to the Paper itself, I should have been glad if the Discussion had been more particularly directed to the instructive and novel features illustrated by Mr. Jones' elaborate drawings. Such drawings I have rarely seen, although we are generally favoured with excellent illustrations of the Papers read in this room. Had time permitted and it was my province to do so, there are several novel features of construction I might have commented upon. One feature of importance occurs to me, viz.: that the details of the roofs and upper portions of the market buildings are so constructed as to preserve an equable temperature, which, so far as my knowledge goes, is a primary desideratum and rarely found in existing markets. Mr. Jones' plan is an improvement upon anything I have met with in similar buildings on the Continent. I am informed that even in this cold weather the rooms in the upper part of the building are comfortably warm. I can therefore appreciate the remark that the temperature of those rooms in hot weather is ten or twelve degrees less than that of the outside air. That is one amongst many details in the Paper that will be interesting to all who may be entrusted with anything of this kind of work. I will just allude to Mr. Christian's and Mr. Woodthorpe's remarks upon Mr. Charles Pearson's general markets' scheme. I had the pleasure of being present at some of the many *conversazioni* which that gentleman gave many years ago, and from recollections of his comprehensive plans and suggestions, I think the concentration scheme of markets was only one element of consideration, and that really Mr. Pearson's idea comprised the concentration of all the railway termini, and when the subject came to be discussed before a Committee of the House of Commons, it was shown that by no possibility could such a combination be brought to one spot

without causing such a block of traffic in the locality as would in itself be a great drawback to any advantages that might otherwise be obtained, and in fact the scheme, although magnificent, was proved to be impracticable.

Mr. HORACE JONES, Fellow.—Beginning with the end of the tale will probably suit the members better than beginning at the beginning. With regard to the last matter spoken of by the Chairman, I think the cost of the Metropolitan Markets may be assumed to be somewhat less than £1. per head of population instead of £6.; there being upwards of three and a half millions of inhabitants, while £3,000,000 would be the extreme expenditure upon the markets. It is quite true with regard to the central area of London proper, every five or six persons require a yard of market space; but when you extend it over 123 square miles, which is about the area of population supplied by these markets with meat and fish, it is hardly necessary to enter into the calculation for any purposes of comparison, though it is about one acre of market to one square mile area. It must be borne in mind that these are wholesale markets, and a comparatively small area of space is sufficient for wholesale business. None of these London markets are, correctly speaking, retail. In Manchester, Lyons, Paris, and similar towns, every housewife goes out to market to buy her fowl and salad, but here the commodities are sent away in quantities from the markets, and supplied to the consumers by retail dealers. In provincial markets every greengrocer is a fruiterer; every fishmonger is a poulterer and dealer in game; whereas 123 square miles of population have to be supplied with provisions wholesale from the great London markets. To go back again: our friend, Mr. Charles Fowler, who to a certain extent appears to have the hereditary talent of his sire, who built several charming markets, spoke of the stalls in the foreign markets. A stall is a stall. Everything there which is for sale is exhibited on the counter. This applies to shops as well as stalls abroad. You walk down the Rue St. Honoré and find all the goods in the place are displayed in the windows: whereas in an English shop or warehouse the great bulk of the goods is inside, and they do not want a large stall for the display of their wares, the sample of which they sell requiring only a small space. The next point relates to the Metropolitan Railway and connecting it with this spot. The Chairman, in referring to it, alluded to that very able and clever man, Charles Pearson, to whom we are indebted perhaps for some errors, but also for able suggestions. Our friend Mr. Woodthorpe had something to say on the subject of the early promoter of the Metropolitan Railway. He is always genial, and we always listen to him with pleasure, because he not only amuses but instructs us. Mr. Douglass Mathews spoke of putting the fish market in the most crowded part of the metropolis. The great difficulties which surrounded that question led to the retention of the market in its apparent natural water-side locality.

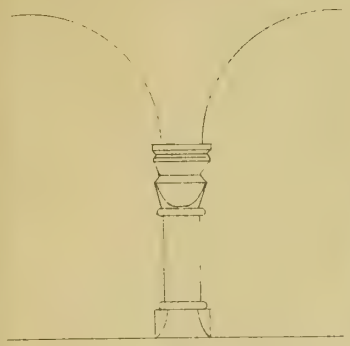
Mr. MATHEWS.—I admitted that it could not be helped.

Mr. HORACE JONES.—I think it quite possible that fish may come easier to London by rail than by water. And now, gentlemen, as you will have to listen in a minute or two to a very much more charming and æsthetic Paper on the Architecture of Norway by Mr. I'Anson, I will not further occupy your time than to thank you very sincerely for the very courteous reception you have given both to my Paper and to myself personally.

The CHAIRMAN then invited Mr. I'Anson to read his Paper on "The Architecture of Norway" (*for which see the next page*).

BORGUND CHURCH

NORWAY.



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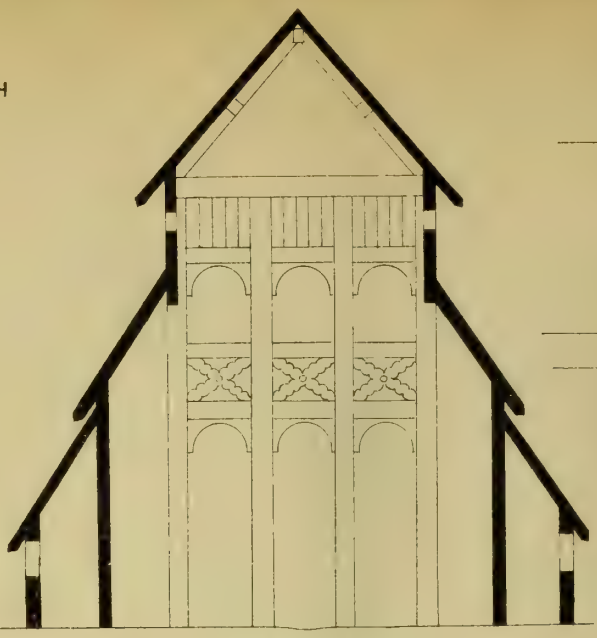

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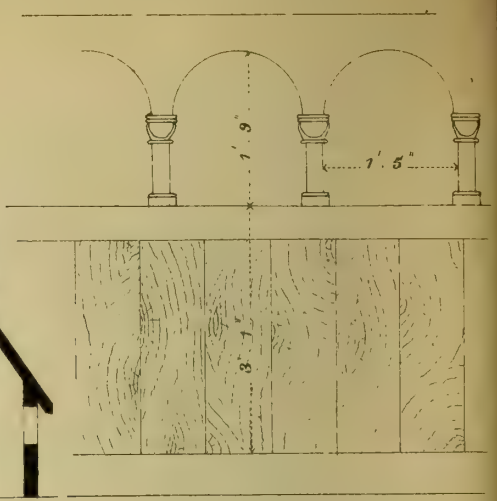

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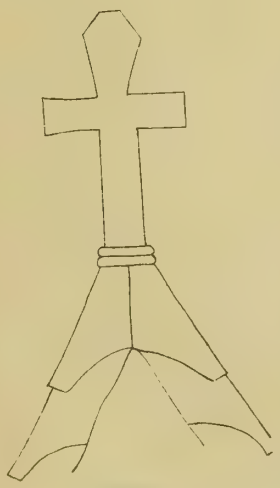

CROSS
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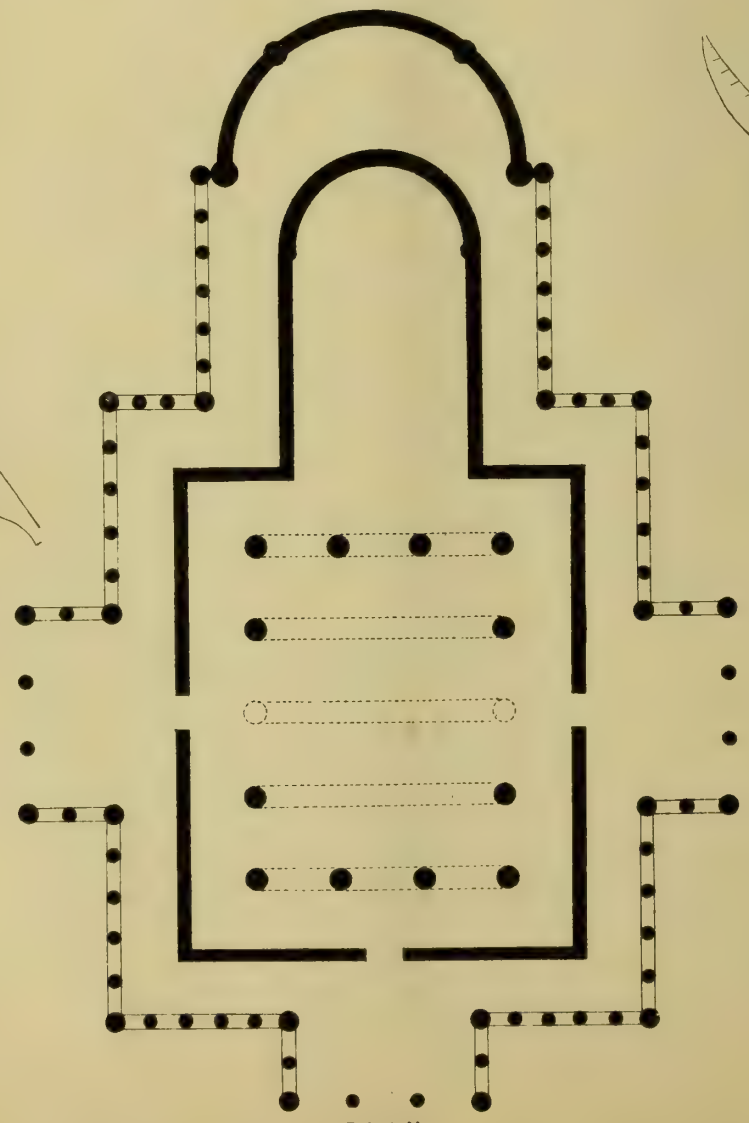


PLAN.

ROOF FINIAL

ON THE ARCHITECTURE OF NORWAY.

By E. I'Anson, F.G.S., Fellow.

Norway, I need hardly remind you, lies towards the remotest northern portion of inhabited Europe ; it is on no great highway of commerce, and never was so ; it is and always has been thinly populated ; its mineral riches are not great, its climate utterly prevents its being rich as an agricultural country ; it has no important manufactures, and therefore it is not surprising that it is not much frequented by travellers, and that it is but sparely endowed with any buildings of importance ; it is however not destitute in this respect, and contains a few buildings of considerable interest.

First, beyond all comparison, is the Cathedral of Throndhjem. This would be a fine building in any country. Throndhjem, the capital town of the district in which it stands, contained, according to the census of 1855, 16,000 inhabitants. But a small portion of the Cathedral which was undergoing, when I was there (1874), extensive repairs and restoration, is at present in a fit state to be used. The service of the church is carried on in the south transept, and under the tower at the intersection of the nave and transepts and the whole portion westward of the central tower is in ruins.

The history of the Cathedral, which I am enabled to offer, is taken from a work entitled "Norge fremstillet i Tegningyr," by Chr. Tönsberg, published in Kristiania, Nov. 1855.

The Cathedral, or, as it has been called, Christchurch (or the Trinity Church of Throndhjem), was formerly the first, wealthiest, and most richly endowed church of the kingdom. The enshrined relics of the Norwegian martyr and saint, King Olaf Haraldsen, which were preserved here, attracted, during the Middle Ages, a number of pilgrims, who by their offerings, greatly enriched this church. It has a length of 350 feet, is built in the form of a cross, at different periods, and consequently in different styles. The church was first erected about 1080, by the Norwegian King, Olaf Kyrre, in the Romanesque style (with round arches), and the architects were probably Anglo-Normans. The western part of it had a nave with two aisles, whilst the transept was without aisles, as well as the eastern part or choir, which seems to have had a semi-circular projection to the east of the high altar, and which stood exactly above the spot where King Olaf had been buried. The church remained unchanged until Archbishop Eystein (1161-1188) added a chapter house on the north side, which formed an independent building in the Gothic style (with pointed arches), and was by a gallery connected with the choir. His intention was to extend and rebuild the whole of the church, and he began with the choir, but at his death in 1188, the work was far from being completed. After that the work advanced slowly, being frequently interrupted by civil wars, nor was it until 1247 that Archbishop Sigurd was able to lay the foundation of the western part or "long house." The transept remained unchanged, and with the exception of a few comparatively unimportant alterations and repairs, has been preserved as erected by Olaf Kyrre ; the other parts are in the Gothic style of the thirteenth and fourteenth centuries. The "long house" consisted of a nave and two aisles, divided by two rows of columns, whilst the choir, which by the restoration also had received two narrow aisles, had five pillars on each side, to which must be added the four

large pillars which carry the central tower, formerly terminating by a spire. From the choir protruded an octagon out-building with a gallery and three side chapels, the easternmost of which was connected with the chapter house. The nave, both in the "long house" and in the choir, was raised a storey above the roofs of the aisles. The interior, as well as the outside of the church, was richly ornamented. There was a principal tower and spire which stood in the centre of the building, whilst two lesser towers and spires rose one on each side of the western façade.

Hardly half a century had elapsed since the rebuilding of the church, when it was destroyed by fire on the 3rd April, 1328, and again it was struck by lightning and burnt in 1431. On both these occasions, however, means seem not to have been wanting to restore the building to its former state. But when, May 3rd, 1531, it was again injured by fire, public feeling was greatly altered. The Reformation, which spread over so large a part of Europe, was adopted here in 1537. The superstitious reverence for saints was gone; pilgrims no longer brought their gifts: and the church was stripped of its treasures, which were carried to Kopenhagen. After that it was never restored to its former splendour, but remained in a very ruinous state during the greater part of the sixteenth century. In 1564, the Swedes who had taken the town, removed the last silver nails out of the coffin of St. Olaf, and carried away the coffin itself to a church in Stïrdalen, but from whence it was again brought to Throndhjem. After this, however, part of the church, viz.: the choir and high choir were restored so as to serve as a parish church; but it was a restoration which hardly served to satisfy the most modest claims of the Protestant church service.

The fires by which the town of Throndhjem was destroyed in 1599, 1657 and 1681, spared the church, which was by degrees, tolerably repaired, but in 1689 the central tower was thrown down by a storm, and in 1708 the whole church was again injured by a fire, as was also the town, and before the damage had been repaired, it was again, on January 25th, 1719, struck by lightning and suffered again by fire. Since that time it has no more been exposed to such disaster, and although but the eastern part of the cathedral remains in its restored condition, it must still be looked upon as the finest monument of middle age architecture in Norway. The roof covering the projection of the high choir dates from the last century, before that period it boasted a pointed spire.

The above description is taken from a Norwegian work of some authority, but as it does not read very clearly, I refer to a briefer notice given in Fergusson's Hand Book. The transept he describes as having been built by Archbishop Eystein, between 1160 and 1183. All that stands eastward of the transept was rebuilt during the 60 or 70 years succeeding 1183. In 1248 the nave was commenced, and after the fire of 1328 the circular choir was built. Its length was 346 or 350 feet; its breadth 84 feet, except at the west end, where it was 140 feet inside.

The exterior of the church, particularly that part which is first seen on approaching from the town, namely, from the north-east, is certainly picturesque. The upper part of the Lady Chapel (or high choir), which is the most remarkable feature in the church, rises to the height of the walls of the choir which it adjoins. On each of its five sides, which are detached, are three lancet windows, so that internally there is abundance of light admitted to the east end of the building. The piers between the windows are buttressed by flying buttresses of extremely slight construction, tied and braced with iron. Above this, in place of the spire-shaped roof, by which it was originally covered, it is now covered with a bulb-shaped dome and cupola. At the extreme east end is a small chapel rising to the same height as the aisle walls of the Lady Chapel. On the north and south sides are two other small square chapels—that on the north communicating with the Chapter House or Kapitel. This portion of the church, including the three small chapels, are all in the early English style. The choir of the church eastward of the transepts is without buttresses, and the

three two-light windows on both sides are modern windows. In the north transept, the lower part of the walls of the north front and the upper part of the side walls, all the arches are semi-circular headed and Norman, whilst in the upper part of the north front the arches are pointed.

On the north side is the Chapter House (or Kapitel as it is styled in the Norwegian language) and has been completely restored recently. It is of good Norman character.

The transepts have no aisles, but there are chapels in each transept on their eastern sides. The central tower is low, only rising a little above the ridge of the choir roof; the window openings it contains have pointed heads; it is now terminated with a roof of low pitch, instead of the additional storey and spire which it once possessed. There are many indications of the injury which the masonry of this part of the building has sustained from the numerous fires it has suffered from, evidenced by the frequent use of iron ties, particularly on the south front, to bind the masonry together.

All that portion of the building, the nave, which is westward of the central tower is low and unroofed. It contains a range of windows with pointed heads, and between the windows are buttresses of slight projection, apparently insufficient to resist the thrust of any internal vaulting, although in the interior there are still the remains of the springing of the arches which covered, or were intended to cover, the aisles; for it seems uncertain whether, in fact, the west portion of the church ever was completed.

The western front was originally flanked by two towers, and is now composed of two arcades of pointed and foliated arches of excellent Early English character, it leans so much out of the perpendicular that it is buttressed by very unsightly and large piers, which have been built without any reference to the architecture. All the slender pillars from which the arches spring are gone, both in the upper and lower arcades. Towards the north end in the upper arcade are the remains of four figures, and towards the middle one which is nearly perfect. In Laing's "Norway," he says, "There are twenty niches in this front, which were all originally filled with figures. From the folds of the dresses, hands and hair of the heads, they could not have been the work of the same age or country which produced the grotesque masks and figures which are strewn with profusion over the most ancient parts of the building. They are of a different taste or school from those figures in the Cathedral of Amiens and other churches of the same period; they display considerable merit, and deserve an examination by a competent judge."

The south transept has a square projecting building of modern construction which half obscures the lower part, above are the remains of a double arch which is imperfect, and above that the gable has been finished with a plain brick wall, replacing the ancient arcaded gable; which work, from the date it bears, appears to have been done in 1666. The arch to the porch on the south side of the choir eastward of the south transept, is richly moulded and decorated. There is a string course above it thoroughly Byzantine in character, whilst the lower mouldings of the arch are filled in with foliage and animal decoration very similar to our good Early English work as at Peterborough. All above the string course, on the south side of the nave eastward of the transepts, the work is modern, as on the north side; so are the windows: but on the north side, next the tower, sufficient traces still remain of the ancient windows to indicate their character. All the roofs are covered with pantiles, which gives to the whole a mean and poor appearance.

As to the interior of the church, beginning at the east end, is the Lady Chapel, Höichoret, or High Choir, an octagon centre built within the semi-octagon apse of the original Norman Church, with three small but beautifully decorated Norman chapels grouped round it, one at the east end and one on either side, the lower part of the walls of which are surrounded with arcades, very late

Norman or Early English in character, richly decorated with foliated arches, while the windows above as well as the vaulting are quite Early English in character. Almost all the small columns in the wall arcade are gone; but these portions of the church are undergoing restoration.

The Lady Chapel, or High Choir, as it is described, is of very elegant constructions. The interior indicates a style, except as to the upper windows, considerably later than the Early English character of the exterior; indeed, some part of the interior, especially the lower part of the wall, which surrounds it on three sides, is panelled with work as late in character as our English Perpendicular, and more nearly resembling it in style than either the French or German work of the same epoch, whilst the arcading of the triforium is of the style of our Decorated.

The original arcades of the choir westward of the High Choir and the walls of the clerestory are gone; and all this portion of the church now utilized for service is enclosed with wooden framing boarded over, so that nothing can be seen of the original building. The arcading of the walls of the aisles, however, still remains; they are, on both sides, very ornate. In one case the arches are of the earliest Early English style, whilst on the other side they are Early English of a later date.

In each of the transepts there are chapels as before described. On the inner or western side of each the mouldings of the arches which communicate with the transepts are profusely decorated with Norman enrichments of the character of Durham; round the lower part of the chapels are arcades with round-headed arches, round-headed windows above, and a vaulted roof of early English character. The triforium of the transepts has semi-circular-headed arches containing two smaller arches and a central column, and the clerestory has semicircular-headed windows separated by piers surrounded by a cluster of three columns. On each side of the central tower in the eastern wall of each transept is a recess with a pointed arch over to contain a monument. West of the central tower the nave is now unroofed, there are the remains externally of the wall arcade in the lower part covered by pointed arches, and above are two-light early English windows, containing within the arch which covers them an open circle between the heads of the two lights, and in the piers between the windows are the lower parts of the ribs of the vaulting of the aisle roofs.

The next church of importance is the Church of Stavauger. This, like the Cathedral at Throndhjem, is built of stone, but no part of it is a ruin, it is a fine Norman church, with the chancel of the Decorated period. There is a fine porch on the north side, and the interior is fitted up with some 16th or 17th century wooden screen work of good character. It has been recently restored, and is in perfect condition. The east end is square.

At Christiania, is a church described in Murray's Handbook as the oldest church in the town, the Church of the Gamle Akers, and as having been restored in 1860; but I found that this restoration consisted in fact of an entire rebuilding. Whether it faithfully reproduces the old building I am unable to determine; it is a good specimen, however, of a plain Norman church.

The only other stone churches which I saw, were a large Norman Cathedral at Stor Hamor on the Möosen Lake not far from Christiania; of which however all that remains is an arcade of four arches and three massive columns. This cathedral was burnt and plundered by the Swedes in 1567, but it remained until the 17th century, when it went to ruins. At the same place there were three other churches, vestiges of at least one of which still remain and are incorporated in a modern church which is visible from the Lake.

In other parts of Norway which I passed through, I noticed some, and probably there are many other churches of Norman character, built in stone, but except one I noticed at Vossevanger, near Bergen, and a castellated building of some extent at Bergon, there are no important mediæval buildings which came under my observation.

There are, however, other buildings, churches of small dimensions, but of considerable interest and exceptional character, well worthy of notice. I refer to some remarkable wooden churches, of which the two best known are those of Hitterdal and of Borgund. There is at least one more at Urnes, as there is an illustration of it given in Weale's Quarterly Papers, and there may be others still extant. That which I saw was the Church of Borgund, but having seen drawings of the Church of Urnes and numerous photographs of Hitterdal, I am enabled to say that they are all very similar in character. They are of wood, as very many of the more modern country churches still are; that at Borgund has a covered gallery all round, the object of which is by no means apparent, unless it be to protect the walls by the roofing which shelters them. The centre part of the building is raised higher than the aisles, so as to procure a clear storey. There are thus three roofs surmounting the building: the lower roof being that to the external gallery; the second roof being that over the aisles, and the third and upper roof that which covers the nave, and above that on the ridge of the upper roof is a square turret, but whether ever used as a bell turret is uncertain, for near the Church is a distinct and separate belfry. The building being nearly square, the roofs as before described rise one above the other at a steep pitch, and thus assume a pyramidal form. Where there are gables to doors or windows, or to the main roofs, the ridge which covers them is at its end turned up and finished with a recurved perforated wooden finial, the whole strongly resembling the roof of the Kew Pagoda, and decidedly Chinese or Asiatic in appearance. The exterior is covered with wooden shingle placed lozenge-wise, or with plain wood slabs, and the roofs are covered with rough lozenge-shaped wooden shingle, so that the appearance is rough and mean. Its picturesqueness and its very distinctive type of character, however, quite redeem it from insignificance. The interior of Borgund Church is as rude as the exterior: the nave columns are simple pine posts with neither capitals or bases, and except a rude and simple notching of some of the timbers supporting the interior walls of the clear storey, there is no attempt at decoration to be seen. Externally the surrounding gallery has a well-proportioned arcade and turned columns with caps and bases. The most decorated part of the church is to the south door, which has small attached columns on each side of the opening, and surrounding it a broad band as an architrave, richly sculptured with ornaments of a very marked Byzantine character. This church is one of the two oldest buildings in Norway: it seems to have been built in the 11th or 12th century, for the arches and the apse are semicircular, and it has all the character of German Romanesque so far as it can be imitated in wood. It is built of Norwegian pine, and protected from the weather by a thick coating of pitch. The nave measures about 15 feet 7 inches × 11 feet 9 inches: the aisles a little over 3 feet wide, and from out to out the body of the Church is about 28 feet by 32: while the length, including the apse, but not including the porch, is 59 feet. A low covered way, about 3 feet wide, runs round the exterior body of the church. The belfry is of much more recent date, and stands some distance apart. A church like this (according to Laing's "Norway") existed at Leir del Sören. It was sold to the King of Prussia, and is now erected in Silesia.

The wooden church at Hitterdal has similar architraves to those of the door of Borgund Church, so also from the drawings I have seen has the church at Urnes, and in the Museum of Copenhagen I saw fragments of the architraves of the doors of other churches all similar in character. The ornament on these architraves represents animals somewhat resembling lizards, or the ideal dragon, intertwining and biting each other, with an intertwining foliage decoration running through and combining the whole. Mr. Fergusson, in his Handbook, characterizes this decoration as Runic, and I have somewhere seen, although I cannot now call to mind where, drawings of crosses either in Scotland or Ireland, ornamented in a similar manner, also described as Runic, which I

consider are simply Byzantine. The stones carved with Runic characters have no sort of affinity with the Byzantine character of the wood carving I have referred to. Fergusson says, there can be no doubt about the age of these curious churches, for he adds, not only does the dragon tracery fix them as of the 11th or 12th century, but the capitals of the pillars and the general character of the buildings exactly correspond with the details of our own Norman architecture so far as the different materials admit. With the latter part of this opinion I cannot say I fully concur, for although in our own and Continental Norman, there are decided traces of this dragon tracery, as Mr. Fergusson calls it, still it is very far indeed from being so fully developed as in these small Norwegian churches. In some parts of the decoration of St. Mark's, ornaments much more similar to it can be found. On the door of the Cathedral at Salerno there is some very similar ornament, and only quite lately I observed some carved ornamentation, almost identical in character, on a door of one of the Romanesque churches at Cologne. It strikes me however as remarkable, that in the same small country, towards the latter end of the 12th century, the distinctly Norman portions of the Cathedral at Throndjhem were being built; and here the ornament was of the style commonly called Saxon, and of which scarcely a trace occurs in the Byzantine carving used in these small churches.

Hitterdal is the next church to which I refer, and which I know only by photographs and desription, and engravings. It is also one of the oldest in Norway, and of the same period and style as that of Borgund. Fergusson says, referring to these wooden churches:—"The largest of these is "Hitterdal. It is 84 feet long by 57 across: its plan is that usual in churches of the age, except that "it has a gallery all round on the outside; its external appearance is very remarkable, it is more "like a Chinese Pagoda, or some strange creation of the South Sea Islander, than the sober "production of the same people who built the bold and massive round Gothic edifices of the same "age." Mr. Fergusson suggests that the panels may once have been adorned by Runic carving, which, as they decayed, have been replaced by plain timbers, detracting much, of course, from the original appearance. Near this church is a belfry as at Borgund, almost of the same form, and both are considerably more modern than the churches near to which they are placed.

Besides the wooden churches, there are in the Telemarken district many wooden houses, or stores, of small size, the ornaments of which are very similar in character to the Byzantine decoration round the church doors, intermixed however with rude Renaissance work, and of them I exhibit some illustrations. Nearly all the houses in the country districts at least are built of wood, and from being cased externally with rough slabs, nothing can well be less sightly in appearance. What is very remarkable is the roof covering:—almost universally the bark of the birch, which is laid on at a comparatively flat pitch, and which has a wonderful power of resisting the dampness of the atmosphere. That this covering must be of considerable duration is evident because not only are the roofs covered with vegetation, but sometimes upon them small trees are actually growing. The roofs are so flat, and the houses so low and near the ground, that the goats easily get on the top of them, where they apparently find good pasture ground.

It is only in the larger towns, such as Christiania and Bergen that the houses are built of stone. They are chiefly modern, few, if any, being older than the seventeenth century. I produce one or two sketches of houses of this character at Christiania.

In the museum at Copenhagen there is a remarkable collection of objects of the pre-historic age:—a vast collection of flint implements, also of bronze and gold, which were not superseded by the use of iron and silver until the third century of our era. In examining the ornamentation on many of the objects of the bronze age I was much struck with the resemblance of some of the ornamentation to the Greek. On several of the bronze vases the form of the Guilloche, with

various modifications, is the common ornament. It occurred to me that these convoluted and interlaced lines, combined with the lizard or dragon form of Byzantine ornament, are the origin of that certainly distinct type of decoration in the wooden churches of Norway, called Runic. On the staircase of the same museum are several sculptured wooden doorways from Norwegian churches, and there is one from a church in Iceland, the decoration on which is pure Byzantine in character.

The only published illustrations I can find of the Norwegian churches are as follows:—A work on Throndhjem Cathedral, well illustrated, but undated and without letterpress, containing perspective views, and many details, drawn by Shirman, and engraved by Le Keux, (but no plan) which is in the Institute library. In Weale's Quarterly Papers there are also some illustrations of the wooden churches, but the description is meagre, and alludes chiefly to the ornamental character of the doorways, and the rude unfinished style of the carved decoration. The illustrations given are the north, south and west doors of the church at Hitterdal: the principal door of a church at Tiud; one of the doors of Borgund church, without a scale; it contains also a vignette of Borgund Church and its belfry. Also in the Institute Library is a work by Professor Dahl, which gives a plan of the church at Borgund, with a scale and a good perspective view taken from the south-east and an interior view looking east. There are also drawings of two of the doorways, a vignette as in Weale's book, and a large drawing of the belfry. There is a plan of the church at Urnes, a perspective view from the north-west, and a perspective view of the interior looking east, in which the wooden columns (for I assume they are wooden) which carry the arcade on each side of the nave, have a proportion very similar to the columns of the Alhambra, with cushion capitals also of very similar form. The boarding which encloses the chancel is shewn to be carved in arabesque pattern, in this respect differing both from Hitterdal and Borgund, and the character of this work, as well as on other specimens given, shews a more refined and artistic treatment than either of the other churches referred to. There is also an illustration of the doorway of Tiud in Telemark; a perspective view of the south side and west end, drawings of the doors, and a view of the interior looking east, shewing a flat panelled ceiling, and columns of less slender proportion than those at Hitterdal, one of them beaded and terminated with a capital, which is very Egyptian in character.

Of course I did not travel in Norway without seeing something of the timber which we import so largely from that country. When I was there it was in the summer, and then the beds of the mountain torrents were nearly dry. Almost all the gorges, in which these torrents ran, were choked up with the stems of trees piled up, in most disorderly and confused manner, one on the other, waiting for the winter floods to carry them down to where these torrents debouche on the sea or fiord, which receives their outlets. Each tree has an owner's mark upon it, and as they reach the end of their course, they are gathered up by contractors, who purchased them before they were felled. In many cases they are sawn and converted into deals, battens or planks by sawmills, worked by the stream which has floated them down. At Christiania, where are the greatest depots, they are taken to the yards of different exporters, who carefully select them, saw them by steam power, season them, and then place them at once on the vessels of different countries, which come close up to the wharves where the timber is prepared, to receive their cargo. There are two kinds of fir trees, the Scotch fir called furu, and the Norwegian pine called gran; the Scotch fir, which in our country produces wood of small value, here produces the best, viz.:—the red deal, while the Norwegian pine, which closely resembles our spruce in its growth, produces the white deal.

The following communication was then read by Mr. F. C. PENROSE, M.A., Fellow:—

ON CERTAIN IMPROVEMENTS IN PAINT MATERIALS INVENTED BY W. NOY WILKINS, ESQ.

I have asked permission to bring before you certain improvements in paint materials, especially in the treatment of the oils generally used as vehicles, invented by Mr. W. N. Wilkins, a marine landscape painter, to whom is also due the discovery of other permanent applications treated of by him in "Letters on Connoisseurship," 1857, and in a pamphlet called "Durability in Art," and in other publications.

The Dean and Chapter of St. Paul's have obtained from Mr. Wilkins the right to use his inventions, so that we now manufacture our own materials, and know the better what we are using. The Dean and Chapter have also permitted me to bring the matter before you this evening, at the particular desire of the inventor, who wishes thus to establish his claim to the credit of these discoveries, the result of long and patient search after durability in pictorial Art since 1852.

The results arrived at are of such extreme simplicity as to make their general application extremely easy, and also to give a strong *à priori* conviction of their permanence. As regards pigments, the chief feature is the entire banishment of white lead from the painter's stock and the substitution of kaolin, mixed with a smaller proportion of zinc white, combined with the limitation of the palette to the mineral colours. Mr. Wilkins has practised for twenty-five years exclusively with these materials, he is perfectly satisfied with them being better than white lead, &c., in every respect, and he appeals to the superiority of his "oil fresco"—as he calls it—when subjected to heat or to chemical tests.

This recent discovery is that the chemical driers, which produce a very unfavourable effect upon painter's work, whether of the house-painter or the artist, causing it to darken and to crack, can be entirely dispensed with, by simply boiling for a short but suitable time a small quantity of Turkey umber in the oil to be used for painting—whether linseed, poppy, or nut oil—producing as desired a drying painting oil or a varnish, and the residuum forming a valuable oil cement.

For details I desire to refer to Mr. Wilkins himself, who will be glad to communicate both on the subject of the oils and of the pigments, with any one desiring to know more, or who may not have read his letters in the *Art Journal* of November 1865, or the "Letters on Connoisseurship," reviewed in the *Athenæum* of November 7th, 1857.

His address is "The Cottage," Elm Grove, Peckham.

A vote of thanks having been passed to Mr. I'Anson for his Paper, and Mr. Penrose for his Communication, the Meeting adjourned until Monday the 4th of February, when Mr. I'Anson's Paper will be discussed.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday, February 4th, 1878, Mr. CHARLES BARRY, President, in the Chair, the following business took place:—

DISCUSSION ON MR. E. I'ANSON'S PAPER—THE ARCHITECTURE OF NORWAY.

The PRESIDENT.—We now come to the Discussion of the Paper which Mr. I'Anson was so good as to read on a former occasion. I dare say most of you have read it. It bears upon a subject new to many of us. It is entirely new to myself, but is interesting not only on account of the information it contains, but for the suggestions which it raises. Amongst other things that occurred to me, and I say this to start the Discussion, was the question how it was that, co-existent in point of time, a number of buildings highly decorated, thoroughly architectural, and of an interesting character and style, should have arisen in this old country of Norway in what Mr. I'Anson terms the Early English style, at the same time that wooden buildings of a very rough character, and having no pretension to refinement of detail, were erected there. These buildings seem to be of a small and mean character. It is hardly conceivable also how a structure 14 feet by 12 feet could be dignified by the name of a church in the sense that we understand it: but there may be some explanation of that which Mr. I'Anson has not favoured us with. I have no doubt he has some special personal knowledge to add to that which the Paper contains. Then the Paper raises a question as to the character of the ornamentation called by Mr. Fergusson Runic, and by Mr. I'Anson Byzantine. No doubt some discussion will arise upon that. Mr. I'Anson refers to the similarity of character of this so-called Byzantine ornamentation to that of St. Mark at Venice, which we certainly cannot style Runic. I do not suppose many of those present have had the opportunity of seeing the buildings which Mr. I'Anson has brought under our notice, but still I hope there are some who have, and will be able to supplement the information which has been given us. At any rate we may hope from the Paper itself and the discussion upon it an interest will be excited in the study of these buildings, which will induce those who have not seen them to go and study them. Lastly, as a practical matter in which we are all interested, I would express a hope that Mr. I'Anson will favour us with a little more information about Norway as a great timber-producing country. In the last sentences of his Paper he mentions two descriptions of pine with which we are familiar, but he tells us they appear to assume a different character in Norway to that which they do here. All these are very suggestive subjects—viz.: the simultaneous construction of buildings of a totally different architectural character: the ornamentation, where it exists, and the quality of the wood differing so much in Norway from what it does in England, the species being the same in both countries. These are all matters on which I think a highly interesting discussion may take place. I see present my friend Professor Lewis, who may have been studying the question for the last fortnight, and no doubt he will have some information to give us.

PROFESSOR HAYTER LEWIS, Fellow.—I am sorry to say that I have not been in Norway, and that I know scarcely anything about its architecture. But having read Mr. I'Anson's Paper, I noticed that he alludes particularly to Early English architecture being well developed, and many

specimens of it found in these churches in Norway. Early English is peculiar in many of its forms, particularly in foliage; in the contour of the mouldings of the capitals, and other peculiarities, and it has seldom fallen to my lot to find any great specimens of this distinctive work abroad. Even in France, where one would expect to find it, you may go through a large number of churches and not meet with one specimen which one could say was clearly carved by the Early English masons, just as Sir Gilbert Scott has stated you may go through Westminster Abbey and find only one or two specimens of French carving amongst 13th century work of the Abbey. Therefore we should be glad to hear from Mr. I'Anson whether this 13th century Early English work he refers to has the peculiar characteristics of the work of our own country. Then again, as to Perpendicular work. It is seldom found abroad, although to some extent it contains peculiarities which we are accustomed to associate with English Perpendicular work. I should like to know how far the characteristics which mark this style in England are found in these buildings in Norway. I will venture to direct attention to the work of Sir C. Anderson, which was published in 1852, and which contains the particulars of a highly interesting church before it had undergone a process of *restoration*, which seems to have involved pulling it down and rebuilding it. Sir C. Anderson's work shows that church in the old style, and a particularly interesting one it is.

Mr. G. E. Street, R.A. Vice-President.—We are all grateful to Mr. I'Anson for describing buildings which he has seen in a country so seldom visited by architects. My own acquaintance with the works described is simply that which is gained by one who takes the trouble to look at books, such as one on the table before me, which contains Schirmer's drawings of Throndhjem Cathedral. I must therefore apologize sincerely if I venture to differ in some particulars from what Mr. I'Anson has said. He has seen the church: I have not; and therefore I have formed my ideas from plans and not from the living stones, and one knows how dangerous a process that is. If I read his Paper aright, I do not find it possible to agree with Mr. I'Anson as to the ground plan. He seems to assume that the foundations of the eastern chapel, the small church of St. Clement, and the rest, at any rate of the eastern half of the church, are of one time, though subsequently modified. I should ask him to reconsider that question, and see whether he can look at the plan from my point of view. This is not an original view of my own, but is practically that which is suggested by Mr. Fergusson. The first church was I take it, a tomb house, built over the tomb of St. Olaf, and after that was built the detached chapel on the north side which Mr. I'Anson—following the local antiquaries—calls the Chapter House, but which was certainly not that, but the church of St. Clement. After that there seems to be some record of a church being built, which no doubt was to the west of the tomb-house, and which occupied part probably of the site of the present choir. At a later period you have record of the erection of the transept, which still remains, and after that the whole of the present nave; and then after that again the old church over the tomb of St. Olaf was pulled down to the ground, and the chapel which now exists, erected in its place.

I think if Mr. I'Anson will allow me to say so, all that we can now see which marks the original size of the thirteenth century choir is its width—which is regulated by the eastern tower arch. It looks to me very much as if the choir had been built without reference to the eastern tomb-house, and that subsequently the two were joined together as well as they could. All the walls are as you will see on the plan irregular and winding, as would be naturally the case in such circumstances. One of the most interesting and at the same time perfect parts of the Cathedral which now exists is that separated chapel north of the choir, which is now approached by a narrow passage and a flight of steps from the high choir or Lady Chapel. Originally, as I have said, it formed no part of the church. It is an arrangement of which there are many examples, as for

instance the church of St. Regulus at St. Andrews, Cormacks Chapel at Cashel, and the Chapel near Killaloe Cathedral; in all which you have a distinct church standing by the side of another church, and in this case the connection with the Cathedral is not original, but comparatively modern. The whole building is one of extreme interest. Indeed I know few more interesting buildings, judging only from the drawings and photographs. Unfortunately Mr. I'Anson has not as he ought to have done, given the lines of the groining on his ground plans; but the church has a nave of two bays of quadripartite vaulting, and then between it and the apse three bays of groining opening with three arches to both nave and apse, the central arch being the chancel arch, whilst the side bays form recesses for two altars, open towards the west and closed at the base on the east. There is an illustration here in Mr. Schirmer's work which clearly represents the beautiful interior of this chapel. It is such a remarkable work in many respects, that I should be glad to find anything which will explain its history. Much of the design is unlike the character of English work, and looks to me much more like German. The groining has a feature which is never seen in English work, viz.: a simple small roll edge to the diagonal vaulting ribs—a feature as you know of common occurrence in Angeirne work of the thirteenth century. Now it would be a matter of great interest to find out what historical connection there is between this church in Norway and churches of a similar character in other countries. That there is a historical as well as a geographical probability that the art of Norway came from our own country is obvious enough when we consider that when this chapel was built, or shortly before Nicholas Breakspear, better known as Adrian IV., the only English Pope, was Legate in Norway, and obtained the elevation of Throndhjem to Metropolitical rank; and what more natural than that a man of his influence should have had some voice in the architecture of the church? Then again if we go across the sea to the north of Scotland, to Orkney, we shall see in Kirkwall Cathedral a church built at a time when Orkney was under Norse rule, but as English as possible in its architectural character; and I judge from all the illustrations that we have of Throndhjem, that it too was an exotic built and designed by men brought to that country—and not the indigenous growth of Norway. And here I should like to ask Mr. I'Anson whether or not he considers that a scarcity of workable stone in Norway, accounts for the large amount of building in timber? This great church is built of stone which was evidently easily worked, because there is throughout a lavish amount of enrichment and ornamentation. The next work in point of date to the church of St. Clement is the transept, which is very fine in its character, both inside and out, and is as thoroughly English as can be in character; and there are some good plans and drawings of it in the book which I have already referred to. A very noticeable point here is the peculiar arrangement of the large eastern chapels, one of which occurs in each transept. I hardly know of anything which looks so much like them anywhere as the eastern chapel of the transept of Kirkwall Cathedral, and if that is so, it is interesting in connection with what I have just been saying.

I must venture here to correct a little error which appears to have crept into Mr. I'Anson's Paper. He follows the example of the Norwegian writers in calling the church of St. Clement the chapter-house. I venture to say it is no more a chapter-house than I am. As he will see in some of the photographs and drawings, there are outside the south transept evident marks of a groined building. That was probably the slype, and next to it on the south stood the chapter house; and I should like to know whether Mr. I'Anson can tell us if against the south transept and south side of the nave, there are marks of any other buildings such as *e. g.* a cloister or other conventional arrangements. This transept is so completely like what we call Norman work, and so much of the

Cathedral is so similar to our own Early English, and some of it to the character of which we call Decorated, that I am not at all surprised that Mr. I'Anson used the terms, though I do not understand him to regard it as being certainly English work.

After the transept, the next work to which I call your attention is the octagonal chapel at the east end of the choir, which seems to me to be one of the most beautiful works possible. The design of it can hardly be seen from these small photographs, but the general scheme and most of the details seem to be very beautiful indeed. The ground plan I imagine was designed by some one who saw his way to complete the whole thing with its four chapels. I cannot help thinking, that when built, the choir was shorter than at present, leaving a space between its eastern wall and the eastern chapel through which every one could pass, but that subsequently the chapel or tomb-house was rather clumsily joined to the choir in such a way as to produce something of the effect of the French Church, which itself, as we know, was developed in this way. As regards the ground plan of this Eastern Chapel, I know of no building which leads up to it, unless, indeed, it be the outline of the little church at Borgund which Mr. I'Anson illustrates, and which is of earlier date than the chapel at Throndhjem. The plan here consists of a central octagon surrounded by an aisle, out of which gabled chapels project on the east, north, and south sides—a plan which of necessity is very picturesque both inside and out. A noteworthy feature in this building is the clerestory, which has triple lancet windows with a well-defined gabled canopy over them. I really know of no example of a similar treatment save that of the central lantern of Lausanne Cathedral, which is, however, a most unlikely place to give a hint to the people of Norway. Here again I am obliged to ask Mr. I'Anson for information. He speaks of the triforium having "decorated" tracery. Did he observe whether it was banded into the wall, and of the same age or a subsequent addition? It looks like thirteenth century work, except this decorated tracery, and it strikes one that unless the tracery was inserted afterwards into the earlier arcades, the whole upper portion of the building must have been of the same age as the triforium—and in that case a curious example of copying earlier work—for it would have been impossible to build a new triforium without destroying and rebuilding everything above it. I should like to know, again, whether the curious screens at the lower part of the arcade of the chapel which Mr. I'Anson described as of Perpendicular character, were carried all round the octagon so as to shut the whole aisle from it. In Mr. Schirmer's plans these screens appear to be built up with the columns, and altogether I cannot help having some doubts as to the age of the whole of this chapel. The choir is now to a great extent modernized; and I would ask what remains there are of its side walls and arcades, and whether any trace exists inside of the old clerestory of which I see the commencement on the south side of the choir near the tower? I should like to know how far that goes, as it appears to be very beautiful thirteenth century work.

The great glories of Throndhjem, to my mind, are the eastern chapel and the west front. I believe this last is of English design and workmanship, and it is one of the most beautiful possible examples of early English work. I should like to know whether Mr. I'Anson is certain that these projections at the north and south ends were built for towers. Except at the outer angles of the front, there is no evidence showing any preparation for the buttressing of the tower. It is not so at Wells—to which one is inclined to liken such a front as this—where the buttresses of the towers rise from the ground. I should like beyond anything to look at a structure which has so many beautiful features about it, incomplete and half-ruined though it is, and to know something of the history of the men who built it. This book of Mr. Schirmer's contains, unfortunately, no letterpress, and we are left to conjecture as to the history of the building. But the detail of the arcading with which

both its stages are covered, as well as the general character of the design, point unmistakably to an Englishman as the architect. The nave is now all but ruined, but still the details of the aisles are very beautiful, and it is evident that both nave and aisles were, like the rest of the church, roofed with stone vaults. I should add that some remarkable features are presented in the doors. There are three western doors, now blocked up, and four other doors remain. Mr. Schirmer's book gives illustrations of the latter. One is of remarkable design, and is on the south-east side of the octagonal chapel or tomb-house—I need hardly say a most unusual position. The other doorways are on the north side of the nave, and in a porch on the south side of the choir, also an unusual position, and recalling to mind the famous doorway at Lincoln. I would add to the task which I fear you will think that I have already imposed upon Mr. I'Anson, by asking him to tell us something about the mode of construction of these wooden churches, to which the latter part of his Paper was devoted. I want to know how the timbers are put together, or whether there is anything in the nature of lob or wattle—as *e.g.* in our Hampshire wooden churches—between the timbers,—whether they are entirely covered with wood planking ; then on what foundations they rest—whether these timbers which have stood for eight or ten centuries rest upon stone walls, or whether they go into the bare ground. Then, again, I should be glad to know what is the construction of the roofs, and whether this curious system of gables and dormers with which they are finished has any pretence to be of the same age as the arcades beneath. I confess they look to me as if they were comparatively modern, and I am at a loss to know whether the apparently Romanesque portion of the work is really of early date or comparatively modern work. Finally, and above all, it would be interesting—going back again to Throndhjem—to know more of the history and origin of the architectural characteristics of this grand structure—whether it can be proved to be what it seems to be, of English origin. In that part of the world there are, it seems, so few stone buildings of importance, and of these none have anything like the same amount of architectural character ; so that it is quite impossible that such a building could have arisen, as our own have, by development from other works in its neighbourhood, inasmuch as there are no buildings in stone or other buildings which would lead up to it. The people of Norway, as we know, travelled great distances in all directions, and it is quite possible that in their wood-work, as Mr. I'Anson has suggested, they repeated something which they had seen at an enormous distance from their own country. But stonework such as that in Throndhjem Cathedral necessitates the employment of a number of masons to execute it, and it is fair to assume that some fifty or sixty masons must have been employed at one time on such a work as the nave, all natives of other countries. I have said that Kirkwall Cathedral, which of all others is the one most likely to do so, shews some evidences of similarity, as also do some churches in the mainland of Scotland ; and we must remember that the early Scotch churches are all of them distinctly the work of English architects. The plinths throughout the eastern part of Throndhjem are remarkable for an extreme elaboration of mouldings ; and in looking through my sketch-books the nearest approach to them that I could find happened to be at Tynemouth Priory—a place sufficiently geographically near to Throndhjem to be a natural place for the Norwegian workmen to come from. However this may be, the subject is one of the greatest interest, and this must be my excuse for having ventured to speak at such length on a building of which I have no personal knowledge.

Mr. BLASHILL, Associate.—Looking through this book I noticed the peculiarity of the capitals of the columns. There are some ornamental capitals peculiar to the period of Henry II, and I think that fixes pretty clearly the date of this church. There are some of the same kind in Hartlepool church, whence probably masons may have gone over to Norway.

Mr. W. PAPWORTH, Fellow.—I can explain about the book to which reference has been made. It was a gift to the Institute from the Ecclesiological Society, through Mr. Beresford Hope. The book is perhaps a *monograph* of Throndhjem cathedral: it was if I remember aright published by order of the Norwegian government, and I think the plates in the copy in the library are perfect, but we have not the letterpress, which was printed in a smaller sized volume, and hence, as is often the case under such circumstances, the plates and letterpress have become separated.

Mr. T. MORRIS, Associate.—I would merely mention that in Ripon cathedral there is on the east side of the *south* transept a building almost identical in form with that which has been described on the *north* at Throndhjem. My impression at the time of my visit and Sessional Paper, was that it had been either the original church in connection with which the cathedral was afterwards built, or had served as a baptistry. It agrees in character with the apse and general form of the corresponding feature in the view here shown of the Norwegian structure, and would appear to be of about the same age. There is indeed so great a similarity in all respects that I cannot but beg leave to call attention to it.

Mr. I'ANSON, Fellow.—I regret that I am unable to reply to some of the questions which Mr. Street has put to me this evening. I congratulate the Meeting on my Paper having called forth the enlightened criticisms and observations which have been made by Mr. Street, who has been enabled by the mere inspection of the plans to give a much more learned account of this building than I, who have seen it, am able to do. With respect to the chapter house it is quite true that I adopted the name from the Norwegian description; I did not look with care to see if there were traces on the south side of the cathedral of a cloister, and I do not recollect that there were traces of its existence. The stone screen to which I alluded is more nearly resembling English Perpendicular than either French work, late German work, or that which surrounded a portion of the high choir. It is not strictly English Perpendicular, but has much of the characteristic of our style. I do not indeed know anything out of England resembling our English Perpendicular work except in some of the churches of Vienna. I am not able to say whether foliation in the arches of the triforium in the high choir was added after the arches were built in, if so the addition is of a date later, probably by half a century, than the windows of the clerestory above, which appear to be the oldest. The triforium is the next, and the enclosing walls round the high choir are next in date. Mr. Street asks whether there are any evidences that there ever were towers over the lateral projections at the west end. I am unable to say. All I can say is when I was at Throndhjem the building was in course of restoration. Unfortunately I could not see the architect, but I saw drawings of the proposed restoration, which show two western towers terminated by three piers.

I have two books printed in the Norwegian language, which I shall be happy to present to the Institute, and if translated they would add to our knowledge of the subject.

I will now say a few words about the wooden churches. They are very small; there is very little attempt at interior ornamentation. The pillars of Borgund church, of which there are four on each side of the nearly square centre portion, rise from the floor up to the roof. Between the pillars on the ground floor is a filling in of wood in the form of an arch. Where they rise above the arches, they are braced together by cross braces notched on the edge, and these cross braces are the only pieces of ornamentation in the interior of the church. Above that is the clerestory. The roof is carried by trussed beams; there is no filling-in between the timber that I recollect, but of simple slabs of wood. With regard to the foundations, to a certain extent at Borgund they are of stone, but whether the whole foundations are of stone I did not sufficiently notice. That leads me to say a word about the stone of which the cathedral of Throndhjem is built. Primitive rocks,

principally gneiss, prevail in Norway, a stone which is by no means well adapted for constructural purposes. At no great distance from Throndhjem there is however a stone of a beautiful character, almost white in colour, which is procured in long slabs, and of this stone the cathedral is principally built. With regard to Runic decoration upon the doors of this church, I have here a drawing of part of the decoration on the jamb of one of the doorways, supposed to be thirteenth century work. My own theory is that it is of Asiatic origin. I exhibit a drawing of the decoration of the Treasury of Atreus, the age attributed to which is at least 1000 years B.C.; drawings also of enrichments of bronze and gold implements of the bronze age. I have here a drawing of other ornamental details on implements of the fifth century, on which we see the introduction of animal forms. The simple spiral forms on the Greek form gradually passed into the intertwined lines mixed with animal and slight indication of vegetable form which prevail in Byzantine work, and so modify in the twelfth century into Runic. Here is a drawing of a decoration on a church in Iceland, which is purely Byzantine. Throughout the whole east part of Europe the influence of Byzantine art is to my mind very apparent, and remains to the present day. The type of almost all modern decoration in Germany is still very Byzantine.

Mr. STREET.—Unless my memory deceives me, I believe there are plaster casts of three or four of these doorways at South Kensington.

The PRESIDENT.—On the last occasion when Mr. I'Anson read his Paper I was not present, but a vote of thanks was very naturally accorded to him. I venture to think that will be repeated this evening after the interesting Discussion which the Paper has elicited, both to Mr. I'Anson for his supplemental remarks, and to my friend Mr. Street who put a long list of questions of an interesting character. We have a few minutes to spare before the usual time when the Paper of the evening is read, and I am under the apprehension that the important senatorial duties which Members of Parliament have to discharge to-night may prevent Mr. Brassey from reading his Paper, in which case it will be read by the Secretary. In the meantime I will recur to the latter part of the Paper once more. Mr. I'Anson has told us he could not travel in Norway and study its architecture without paying some attention to the Norwegian timber, for which we are so much indebted to that country, but nothing on the subject has come out in the Discussion, and I think perhaps our friend can give us some more information upon it:—the mode of transport, the character of the wood, and to what extent and why the same wood is so different in Norway to what it is in England?

Mr. I'ANSON.—A large portion of Norway is covered with forests of fine trees. As I have said, there are two kinds: one is the Scotch fir, and the other I believe is the spruce fir, but I cannot say with certainty it is the same as the English species of spruce. I have travelled in the wood-producing districts of Russia. There the pine is not the Scotch fir. Norway, as you know, is a long, narrow country, deeply indented with numerous fiords or arms of the sea, which run from the west coast into the interior almost at right angles to the sea-coast. There are some high mountains, though none of them so lofty as the mountains of Switzerland, which are so generally covered with snow. The mountains, some of which attain the height of 3000 feet, rise rapidly from the margins of the fiords which bathe their bases. The giant trees of the forest have already been sought out and have disappeared, but still the timber is in great abundance, and supplies a large portion of the fir which we use in England. The proprietors of the forests sell the wood at a certain period of the year, and at the season when the melting snow in summer flows down the mountain gorges, the hewn timber is cast into the channels, which are sufficient to carry it down to the sea. Each tree before being placed in the gorge is marked by the owner, and reaches the fiords by this water carriage. It surprised me, looking at the rapid rate at which the trees are born down by the torrents and the

rocky beds which they travel over, that more of the trees were not split and broken up. At the time I was there the water had ceased to flow, and the channels were choked and piled up with confused masses of the stems of trees waiting for the water flood to carry them to sea. At Christiania I visited some of the timber yards. When the trees were brought down into the fiords, the agents are on the look out for them, and each owner having selected those trees which bear their marks, they are taken to large stores, where they are cut into different marketable sizes, and sent to the English and French markets. The shore is so precipitous that vessels of considerable burden can come close up to the sides of the stores. The Scotch fir furnishes the red wood, and the spruce fir the white. What strikes one is, that the Scotch fir, which with us is regarded as the least valuable kind of fir wood, scarcely being fit for use for railway sleepers or fences, and only fit for constructive purposes where it is protected from the action of the weather, is the best fir in Norway. I account for that superiority of the Norwegian over the English tree in some measure by the greater length of time that Scotch fir takes to come to maturity in Norway than in this country. Scotch fir grows at the rate of as much as 2 feet a year in this country, and takes about 50 years to become a useable tree, whereas in Norway it would take probably a century to grow a tree of equal size.

The Discussion on Mr. I'Anson's Paper having thus been brought to a close, the President invited Mr. T. Brassey, M.P. to read his Paper "On the Rise of Wages in the London Building Trades" (*for which see next page*).

ON THE RISE OF WAGES IN THE BUILDING TRADES OF LONDON.

By T. Brassey, Esq., M.P.

The present Paper has been prepared in compliance with an invitation of long standing, which I esteem it a great honour to have received. The delay in the preparation of the following statement is due to the pressure of many engagements, and to my protracted absence on a voyage of circum-navigation. Even now I should have been quite unable to have performed my task, without the aid and co-operation of others. I have little spare time for such an investigation, and I have no technical knowledge. Under these circumstances I appealed to gentlemen whom I knew to be thoroughly conversant with the subject, and I gratefully acknowledge their readiness to assist me. Being anxious to collect the information required from impartial sources I applied to Messrs. Hunt and Stephenson, the well known surveyors; as representatives of the builders I communicated with my old friends, Messrs. Lucas Brothers; and lastly, with a view to obtain a fair statement on behalf of the workmen, I asked the co-operation of Mr. Howell. These gentlemen, therefore, are in point of fact the authors of the following Paper. If it possesses any importance as a contribution to the sum of knowledge on that labour movement which constitutes one of the most urgent questions of our time, it is to the practical authorities whom I have quoted that its value must be attributed.

To the Council of this Institute belongs the credit of suggesting that a review of the alterations in the rates of wages in the building trades should be prepared. It is only by bringing into view the fluctuations in prices during a tolerably extended period that the relation between cause and effect can be satisfactorily traced, and principles laid down for the future guidance of masters and men. It was truly said by Lord Bolingbroke that history is philosophy teaching us by examples how to conduct ourselves in all the struggles of public and private life.

I begin by giving a statement of the increase of wages and reduction of working hours in the building trades in London from 1837 to 1847. The current wages of building operatives in London from the year 1836 was 5s. per day of ten hours, or 30s. per week of sixty hours. This rate was generally adopted, but it was not universally paid in all branches of the building trades until 1847. In fact, it was only established as the standard rate by dint of protracted efforts, extending over a period of several years. Masons and bricklayers were the first to secure the advance. The carpenters, plasterers and painters followed their example.

In the year 1847 a movement was set on foot for a reduction of one hour and a half on Saturdays, the men leaving work at four o'clock. This agitation seems to have originated from the idea of the Saturday half-holiday which had been promoted by Lord Shaftesbury and other eminent philanthropists. After a comparatively short struggle the hour and half was conceded; and it soon became general for all branches of the building trades to leave work at four o'clock on Saturdays. Only one master persisted in refusing this boon, and he was ruined for his obstinacy.

In the year 1853 an effort was made to obtain a reduction of time to nine hours a day. The men were offered a rise in wages of 6d. per day which was accepted, and the nine hour agitation was abandoned. The 5s. 6d. per day was not universally conceded in all branches of the building trades for some years, although the leading firms gave it to the majority of their workmen.

In 1857 an agitation was recommenced for the Saturday half-holiday. This was abandoned in

1858, and a limitation of the hours of work to nine hours a day was accepted instead. In 1859 the movement in favour of the half-holiday was again resumed, and the demands of the men being refused, a strike ensued, which was followed by a lock-out of the whole of the building operatives in London. Eventually, in 1861, the masters introduced the hour system, payment being made at the rate of 7d. per hour. A reduction in time was obtained of two hours on Saturdays, the men working through the dinner hour, but leaving work at one instead of four as formerly. In 1865 a rise of a half-penny, making the wages 7½d. per hour, was granted without a strike. In 1866 another rise of a half-penny per hour was granted, making the rate 8d. per hour.

After a strike and partial lock-out in 1872 the masters granted a further advance of a half-penny, making the rate of wages 8½d. per hour. There was a simultaneous reduction in time of four hours per week; the men leaving work on the first five days of the week at five o'clock, and on Saturdays at twelve. The hour for commencing work was at the same time fixed at half-past six on Mondays. In 1873 another rise of a halfpenny per hour was granted without a strike, making 9d. per hour, and the working hours were fixed at 9½ per day, or 52½ hours per week.

In 1876 a Memorial was sent to the Master Builders, asking for an advance of wages from 9d. to 10d. per hour. This demand being refused, on the 30th of June, 1877, the masons struck, and the strike is still pending. It will be seen from the foregoing statement, which embraces a period of 30 years, that there has been a reduction since 1847 of seven hours and a half in time—that is to say from 60 hours per week to 52½ hours. The current wages in 1847 were at the rate of 5s. per day of ten hours, or 30s. per week, for 60 hour's work. In 1877 the current wages were £1 19s. 4½d. for 52½ hour's work, being an increase of wages amounting to 9s. 4½d. per week. This represents a rise of 31½ per cent. on the original scale of wages, at the rate of 30s. per week, and of 12½ per cent. in time value, or a total advance in 30 years of 44 per cent.

Mr. Howell further states that greater care is taken to ensure regularity of employment. The masons and carpenters have better sheds or workshops. Wherever it is possible, the bricklayers engaged in cutting arches, splays, &c., are under cover in wet weather. On the other hand, it is said that large contracts are finished more rapidly. Hence the men have to look out for fresh jobs oftener than they had to do 30 years ago. The time also is kept more strictly than it used to be. A workman must be at his work at six o'clock precisely. No five minute allowance is now given. The workmen are equally prompt in dropping their tools as the clock strikes five.

Messrs. Lucas have prepared a memorandum giving the various wages by the day or the hour both for labourers and mechanics. It will be seen upon examination that these figures, although stated in a different form, correspond exactly with those contained in Mr. Howell's Paper:—

MEMORANDUM OF THE COST OF MATERIALS AND LABOUR, ETC., IN THE BUILDING TRADES.

		Mechanics.		Labourers.	
		s.	d.	s.	d.
Sept. 1853.	Wages per day of 10 hours = 60 hours per week were	5	0	3	0
Sept. 4, 1853, to March 22, 1861	Ditto ditto	5	6	3	4
March 23, 1861, to Sept. 27, 1865 .	Payment by the day was discontinued and the men were paid at the rate per hour of	0	7	0	4¼
Sept. 28, 1865, to May 4, 1866 . .	Ditto ditto	0	7½	0	4½
May 5, 1866, to July 5, 1872 . .	Ditto ditto	0	8	0	4¾
July 6, 1872, to Aug. 1, 1873 . .	Ditto ditto	0	8½	0	5¼
Aug 2, 1873, to present time . .	Ditto ditto	0	9	0	5¾

The present working hours are	Monday . . .	9 hours
Ditto	Tuesday . . .	9½ „
Ditto	Wednesday . .	9½ „
Ditto	Thursday . .	9½ „
Ditto	Friday . . .	9½ „
Ditto	Saturday . .	5½ „
	Total	52½ hours

as compared with 60 hours for the summer and 47 hours for the winter season, commencing 6 weeks before and ending 6 weeks after Christmas.

This shows an increase of 50 per cent. upon the wages of mechanics, and 64 per cent. upon those of labourers. In addition to this, there is a loss in time of 7½ hours per week. The men now only work 52½ instead of 60 hours—a reduction of 12½ per cent. in time; the mechanics receive 39s. 4½d. for the 52½ hours instead of 30s. for 60 hours; and the labourers also work 12½ per cent. less time and receive 25s. 2d. for 52½ hours as against 18s. for 60 hours. It is a remarkable circumstance that the most important advances have been obtained by the unskilled workmen. The lower the original rate of wage the greater has been the advance. This is clearly shown in the following table prepared by Mr. Stephenson:—

MEMORANDA WITH REFERENCE TO THE COMPARATIVE COST OF WAGES AND MATERIALS FOR BUILDERS' WORKS IN 1865 AND 1875.

WAGES.	In 1865 per Hour.	In 1875 per Hour.	Increase.
	d.	d.	
Excavators	4¾	6¼	28 per cent.
Bricklayers	7½	9	20 „
Masons	7½	9	20 „
„ Fixers	8	9½	20 „
Carpenters	7½	9	20 „
Joiners	7½	9	20 „
Smiths	7½	9	20 „
Plasterers	7½	9	20 „
Painters and Glaziers . . .	7	8½	22 „
Plumbers	8½	10	17½ „
General Labourers	4¼	5¾	35 „
Scaffolders	4¾	6¼	28 „
Plumbers' Labourers . . .	4¾	6¼	28 „

It might have been expected that in trades where the Unions were most completely organised the greatest advances would have been secured. But this has not happened. It is the least skilled trades, it is the common labour, the supply of which is not limited by any necessity for a preliminary apprenticeship, which have benefited most by the increased demand for labour. The rise in the rate of wages is doubtless due partly to the increased cost of living. The pay of those labourers whose wages were nearest to a mere subsistence level has been most sensibly influenced by the changes which have led to an increase in the cost of articles of the first necessity. The price of labour, as I have so often reminded employers, in the very terms used by the father of Political Economy, is determined, not by the completeness of its trade organisation, but by its relative scarcity. In the instance before us, we see that the advance has been most conspicuous in the case of labourers who have no trades' union organisation. Are we not therefore justified in the conclusion that trades' unions in the long run exercise but a small influence over the rates of wages in comparison with the inevitable and natural operation of an altered relation between the demand and supply of the necessary commodity of labour?

Let us now proceed to ascertain how far the cost of building has been influenced by the increased cost of labour. First let us consider the cost of materials. Messrs. Lucas observe, "The cost of materials fluctuates from time to time, but as a whole we find that the average cost is about the same as formerly, the reduction of duty on bricks, timber, glass, &c., being in our favour."

Mr. Stephenson has kindly prepared a Memorandum showing the difference in the prices of materials in London between 1865 and 1875. Bricks and Portland stone are cheaper; in timber there is some increase; and in other articles there is a considerable augmentation of price.

MATERIALS.	In 1865.	In 1875.	Increase.
Bricks	34s. per thousand	27s. per thousand	20 *per cent. reduction*
Grey Lime	10s. per yard	11s. per yard	10 per cent.
Roman Cement	1s. per bushel	1s. per bushel	
Portland Cement	1s. 9d. „	2s. 2d. „	26 per cent.
Portland Stone (at Deptford)	2s. 1d. per foot cube	2s. per foot cube	4 *per cent. reduction*
Yorkshire 3 inch.	63s. per 100 feet	83s. per 100 feet	30 per cent.
Middling Dantzic Fir, average price	75s. per load	80s. per load	7 per cent.
Archangel Deals	£14 per standard head	£16 per standard head	16 per cent. mean
Petersburgh Deals . . .	£12 5s. „	£14 10s. „	Ditto
Lead, Milled Sheet . . .	21s. per cwt.	24s. per cwt.	14 per cent.
Glass, Plate and Sheet . .	... ...	Advance about 20 per cent.	

The increase of wages, according to Messrs. Lucas, ought to have been more than covered by the introduction of machinery for many building operations—for hoisting all materials, instead of carrying by hod, and raising by hand labour; for grinding mortar and for the execution of all kinds of carpenter's, joiner's, and mason's work. They say, however, that their experience shows that the cost of building has actually increased from 20 to 30 per cent., and this increase is entirely due to the small amount of work now done by the men, compared with what they did some few years ago. As an illustration of this they refer to the new station, hotel, locomotive works, and goods' sheds at York, which they have recently erected for the North-Eastern Railway Company. These works were of great magnitude and were superintended by one of the most experienced and able members of their staff. The materials were bought for less than the estimated price, and the introduction of steam-power to an unusual extent—in fact whenever it could be used—effected an immense saving upon the labour. But all these advantages were more than neutralised by the indolence of the men. A conspicuous instance is quoted. The labour upon the brickwork, which would formerly have cost 38s. per rod by piece-work, was estimated at a price which Mr. Harrison, the Engineer of the North-Eastern Railway Company, considered liberal for such work, namely, £3 3s. per rod. The actual cost was a little more than £5, or £1 17s. per rod more than Messrs. Lucas received from the Company. In this case therefore a loss of 55 per cent. was sustained upon the estimate for labour. If, however, the men had done a fair and proper amount of work the cost would have been as follows:—

With wages at the prices formerly paid, at the rate of 6d. per hour	£1 18 0 per rod.
Add 50 per cent. for increase of wages at present time	0 19 0
	£2 17 0

In point of fact, the actual cost, as before stated, was a little over 100s. per rod, and this notwithstanding all the additional advantage of the possession of steam-power. This illustration proves beyond all doubt that the men at the present time do very little more than half the work for 9d. per hour that they formerly did for 6d.

These experiences of a large building firm are corroborated from a different and perhaps a more impartial point of view, by Messrs. Hunt and Stephenson. An opportunity of applying an accurate test to determine the depreciation or appreciation in the cost of buildings has recently occurred, Mr. Stephenson having been called upon to make a close professional estimate of the cost of re-erecting an ordinary dwelling-house which had been built in 1865 for the sum of £5,000. The building in question was demolished to make room for a Metropolitan Railway Extension, and it was ascertained that it would cost no less than £5,624 to rebuild it in 1875. The following are some very interesting details as calculated by Mr. Stephenson:—

ESTIMATE SHEWING THE AMOUNT OF EACH TRADE IN A BUILDING OF AN ASSUMED COST OF £5,000., AND THE INCREASE IN COST OF BOTH LABOUR AND MATERIALS.

LABOR.	1865.			1875.					Proportion of Cost of Labor to Cost of Materials in the several Trades.		Average Increase and Decrease in Total Cost in 1875 over 1865.	
	Apportioned value of each trade.	Relative proportion of Labor and Materials.		Increase in Cost of Labor.		Increase in Cost of Materials.		Decrease.	Labor.	Plant and Materials.		
	£	£	£	Per Cent.	£	Per Cent.	£	£	Per Cent.	Per Cent.	£	£
Excavator 90	100	90	10	28	25	—	—	—	90	10	25	—
Bricklayer 25	1200	300	900	27	81	—	—	100	25	75	—	19
Mason..... 60	800	480	320	24	115	25	80	—	60	40	195	—
Slater 10	50	10	40	27½	3	20	8	—	20	80	11	—
Carpenter 25	400	100	300	24	24	7	21	—	25	75	45	—
Joiner..... 60	800	480	320	20	96	16	51	—	60	40	147	—
Smith & Founder 20	350	70	280	20	14	—	—	—	20	80	14	—
Plumber..... 25	350	88	262	25	22	14	37	—	25	75	59	—
Plasterer..... 60	400	240	160	27	65	10	16	—	60	40	81	—
Glazier 15½	150	23	127	22	22	20	25	—	15	85	51	—
Painter 50	150	75	75	22		5	4	—	50	50		—
		1956	2794		467		242					
					1956		100					
					2423		142					
							2794					
							2936					
Fees of Quantity Surveyor, Local Authorities, and sundry other Fees, &c.....	250				265						15	
											643	
											19	
											624	
											5000	
	£5000	£5000			£5624	Nearly 12½ per cent. advance on 1865.					£5624	

Having given the results of the experience of large employers in this country, it may be interesting to you to know that abroad the diminished industry of the operatives under the same conditions has been even more conspicuous. The following paragraph recently appeared in *The Times* newspaper :—

"At the time when prices were most inflated the work and wages of masons in Berlin were submitted to a crucial test. Between 1868 and 1873 the wages of this class of operatives were increased by 50 per cent. In the former year a certain number of masons were accustomed to dress 618 stones of a particular description in a week. In 1873 the same number of men dressed in the same time no more than 304 stones, less than half; and as they were paid as much for the smaller as the greater quantity, it follows that the cost of building a house in Berlin had more than doubled within a period of six years. A similar process has been going on, with more or less rapidity, in most of the cities of Germany and Switzerland. Professor Gustav Kohn, in a pamphlet recently published (*Deutsch Zeitund Streit-Fragen. Heft* 77. *Vertheurung des Lebensunterhalter in der Gegenwart, von Gustav Kohn. Berlin*, 1876), compares the cost of building in London and Zurich, and although there is no great difference between the two places in the price of materials, he arrives at the conclusion that it costs twice as much to erect and finish a house in the Swiss City as in the metropolis of Great Britain, and to this difference he attributes the fact that rents are so much higher in the latter place than in the former. In order to arrive at a just conclusion, he eliminates from his comparison the business and fashionable quarters, where the question might be complicated by the elements of expensive sites and heavy ground rents, and chooses in the most outward periphery of Zurich a locality which is to that place what Wimbledon is to London. If the result of the Professor's investigations is to be trusted, a dwelling that at Wimbledon is rented at £40. a year could not be obtained at Zurich for less than from 1,500 francs to 2,000 francs a year. And as wages, the cost of materials, the value of money and of land, are pretty much the same in both places, it follows that the difference in rents must arise from the superior skill of English builders and the greater efficiency of English labour. This is the conclusion of Herr Kohn, based as well on induction as on his own personal observation and enquiries."

Mr. Howell contends that the nett cost of building has not increased in proportion to the advance of wages. He points to the use of machinery in some branches, to the introduction of better appliances in others, and to the development of greater skill in special branches. As a rule he considers that the foremen are much superior in ability and character to the majority of those who previously had charge of large undertakings. As an instance of work being done more cheaply, he refers to a statement made to him by a mason of considerable experience and skill to the effect that each of the blocks of the fluted columns at the British Museum cost, on an average, £5., whereas now he would be glad to undertake any number of them at £3. 10s. each.

This reduction in the price of stonework for the British Museum would, however, only be possible upon the piece-work system. The introduction of piece-work is earnestly desired by the masters; but, as Messrs. Lucas remark, "By the rules and regulations of the trades' unions no set work or piece-work is allowed, the great object being to obtain the largest amount of pay for the smallest amount of work and the least number of working hours; and with every increased rate of wages they go for a decreased number of hours' work in the day, and do a less amount of work in the hour, so that the public are hit all round."

In concluding their most valuable Paper, Messrs. Lucas say: "We believe the reduction of the hours of labour and the half-holiday a mistake. Any man wanting a holiday can always have it, and the old time of 60 hours per week in the summer months is not too much in such a generally

healthy business. It appears absurd to lose the summer months and not make hay whilst the sun shines. In the winter time it might perhaps be better upon out-door works to commence after breakfast, say at eight o'clock, and leave off at half-past four, with half an hour for dinner, making eight hours per day, or 48 hours per week, or an average for the year of 57 hours, and £2. 2s. 9d. per week wages; and we have not the slightest doubt that the men would gladly fall into such an arrangement, but for the interference of the trades' unions. It is clearly to be understood that the foregoing observations apply to architectural buildings only, and not to contracting and engineering works. These are mainly carried out upon the plan adopted by the late Mr. Brassey, that of *set-work*. A certain amount of pay is offered for a given amount of work. The men are paid for any work done in excess of the minimum amount allowed, and this is the only fair and satisfactory course to be adopted in the building trades in the interests of the men, the masters, and of the public generally."

Having given in detail the successive advances in wages, and shown the increase in the cost of building, it will be interesting to inquire how far the condition of the operatives has been substantially improved by the rise in the rates of wages. Has there been any appreciable improvement in their food and in their dwellings? Is their leisure time profitably and innocently employed? Mr. Howell has supplied a complete statement on this subject. We will take first the article of meat. The rise in the price of meat is concisely shown in the subjoined Table :—

DATE.	AVERAGE PRICES.					
	Beef—per stone.	Increase.	Per cent.	Mutton—per stone.	Increase.	Per cent.
	s. *d.*	*s.* *d.*		*s.* *d.*	*s.* *d.*	
1847—1853 . .	4 2½			4 5		
1853—1867 . .	5 0½	0 10	20	5 9	1 4	30
1867—1873 . .	5 6	1 4	30	6 4	1 11	43
1874—1875 . .	5 8½	1 6	35½	6 5	2 0	45
1876—1877 . .	5 11	1 9½	39	6 9	2 5	50

"In round figures, the price of meat, wholesale in the market, has increased, in the case of beef about 40 per cent., mutton about 50 per cent. Pork has increased proportionately, and bacon at a higher rate still. The price obtained for beasts at the Annual Cattle Shows from 1847 to 1877 is as follows: From 1847 to 1856 inclusive, the average price ranged from 4s. per stone for seconds to 5s. 7½d. for prime cattle. From 1857 to 1866 inclusive, the average price ranged from 4s. 1d. for seconds to 6s. 2d. for prime qualities. From 1867 to 1877 inclusive, the average price ranged from 5s. 6¼d. for seconds to 8s. 1½d. for prime meat. During the latter period the quality of meat has greatly improved, but on the other hand the poorer classes have had to pay more per pound for inferior meat than the wealthier classes have paid for joints of the best quality. The retail price of meat to working people has been increased not less than 75 per cent., or oftener 80 per cent., and butchers are more careful than formerly not to cut to waste. Hence there are fewer pieces called 'block ornaments.' This is equally true as regards slices of bacon. Poultry and fish have advanced

in price nearly, if not quite, in the same ratio as meat. Rabbits fetch even a higher price in proportion. As for hares and other game, the poorer classes seldom taste such things. They know nothing of them, except what they see at the poulterers' shops."

Take next the items of bread, vegetables, clothing and rent: "The price of British wheat has varied from 50s. 6d. per quarter in 1848 to 74s. 8d. in 1855, which was the highest during the past thirty years. Since 1864 it has varied from 40s. 2d. to 64s. 5d. in 1867. The average prices quoted for the last five years have been: In 1873, 61s. 8d.; 1874, 44s. 2d.; 1875, 45s. 3d.; 1876, 50s. 3d.; 1877, 51s. 9d. The ordinary baker's bread in the poorer districts is now 7d. and 7½d. per 4 lb. loaf. It has not been so low as 6d. per loaf for some years. Very inferior bread is nominally cheaper, though actually it is the dearest, in proportion to the solid nourishment it contains. The prices of potatoes and other vegetables, as sold at the greengrocers' shops, have gone up during the past thirty years as much as 100 per cent. Potatoes, which were formerly sold at a halfpenny per pound, and then at the rate of 3lbs. for 2d., are now 1¼d. per pound, being an increase of over 100 per cent. Cabbages, which could be bought at a halfpenny each, are now 2d. or 2½d. Turnips, which were formerly sold at about 2d. per bunch, are now from 5d. to 6d. The price of parsnips has advanced from a halfpenny to three halfpence; and all other kinds of garden stuff are equally enhanced in price. Coal, butter and cheese are most important items, especially the two first. Many thousands of the working-classes buy in their coal by the cwt. or in sacks. For some years past the lowest price charged per cwt. has been 1s. 6d., or 30s. per ton. In 1872-73 the price went up to 50s. per ton. The coal consumed by the work-people is generally very inferior, and the purchasers are robbed in weight and measure. Those who live in apartments have seldom room for more than a sack at a time; but in newer houses room is provided for half a ton or a ton. The article of butter has ranged from 1s. 6d. per lb. to 1s. 10d. for very inferior qualities; it is described as little better than mere grease. The consumption of salt butter has diminished of late years, and Brittany butter has been substituted. Cheese, which in days gone by was cheap, is now rather a luxury. It is not used by poor people as it was formerly. The only articles on which there has been a reduction are sugar and tea; but most working people concur in saying that tea, as sold at the grocers, is not so good as formerly. House rent has greatly increased. Apartments of two rooms on a floor have gone up from 4s. 6d. and 5s. 6d. to 8s. 6d. and 9s. per week. The rent of single rooms has risen from 2s. 9d. and 3s. 6d. to 5s. and 5s. 6d. Small houses are very scarce. For a house with four rooms and a wash-house the rents have advanced from 6s. or 6s. 6d. to 10s. or 11s. Peabody's Buildings and the Model Dwellings are full to repletion; and so great is the demand for accommodation, that enough names are down on the books to fill several more blocks of houses. Boots and shoes are dearer, and the leather is not so good. These articles are of the first importance to working people, who have to work out of doors or walk long distances. Clothing has also gone up in price, although not in the same proportion as other articles. Apparel, however, is usually bought ready-made by machinery, and as machine-sewing is inferior to hand-sewing, clothing is less durable. Cottons and flannels are cheaper, but stuffs and homespuns are dearer, at retail prices, and the quality is much depreciated. Almost every little article of domestic consumption has increased in price. Though the increase in cost may only amount to a halfpenny, the advance is often equivalent to a rise of 40 to 50 per cent. on a small item. It is the universal complaint of the wives of workmen in the present day that they have a difficulty in 'keeping house,' in consequence of the dearness of everything. One of the greatest evils from which the working-classes suffer is that, being obliged to buy in small quantities, they go to small hucksters' shops, or what are called 'general-shops,' where they pay the best price for very inferior articles. The poorer the neighbourhood, the greater the difficulty in obtaining articles of

good quality; and yet the prices charged are very nearly equal to those charged for the best qualities in the best establishments."

The well managed co-operative stores of the North of England have provided a most effective means of supplying the wants of the working-classes. In the Metropolis, co-operative organisation has been but slowly and imperfectly developed. Perhaps the very number of the population has made the work more difficult: there is less cohesion, less interdependence, and less mutual sympathy in the multitudinous masses of the Metropolis, than in the more compact populations of our northern cities, where similarity of employment and a more uniform social status bind the people together, and both dispose and enable them to combine more readily for a common object. Mr. Howell concludes by stating that, with all the drawbacks which he has enumerated, "the majority of workmen's houses are far superior to those of the same class thirty and even twenty years ago. There is an air of comfort and cleanliness, as a general rule, in the homes of the artizans and mechanics, which shows progress and improvement; and there are fewer wretched homes even in the poorest localities than of old."

I have given *in extenso* Mr. Howell's statement as to the economic condition of the operatives in the Metropolis. It affords much food for reflection. It has been shown in the Tables, prepared by Messrs. Hunt and Stephenson, Messrs. Lucas, and Mr. Howell, that, during the period embraced in our review, wages have advanced 50 per cent. for mechanics and 64 per cent. for labourers. In the same period, however, the cost of living has increased in such proportions that the wives of the workmen have experienced an ever increasing difficulty in making both ends meet. Mr. Howell, indeed, describes a general improvement in the interior of the workmen's houses; but that amelioration is probably due to advancing civilization, rather than to the increased spending power of the people. Improved taste and tidier habits, and a more restricted indulgence in intoxicating liquors would have converted a great number of the miserable hovels of thirty years ago into comfortable dwellings, even though wages had remained at the former rates. The consumption of beer and spirits has, we know, increased of late years to a melancholy extent. There is reason to believe that a considerable proportion of the increased wages of the common labourer has been misapplied in self-indulgence. Mr. Howell's remarks as to the improvement observable in the dwellings must be understood to apply almost exclusively to the mechanics; and we may venture to hope that the majority of the skilled workmen have made a good use of their increased wages.

The recent report of Mr. Plunkett on the Railway Riots in America gives most interesting details on the relation between wages and the cost of living in the United States. In America, with every advance in wages there has been a corresponding rise of prices, while, owing to the fall in prices which has followed the recent reductions of wages, working men in regular employment have suffered no privation of the necessaries of life. Workmen are perfectly entitled to take advantage of every turn of the market in their favour; but it is a delusion to suppose that a general advance in the rates of wages, accompanied, as it must be, by a corresponding advance in prices, is pure gain to themselves.

In connection with this subject, I must once more express my conviction that an exaggerated impression prevails of the power of the trades' unions to advance wages by the mere completeness of their organization, apart from other influences, which are more effective and more natural in their operation. In every controversy with the masters the trades' unions occupy a prominent position as the spokesmen and advocates of the workmen; but the trades' unions cannot possibly force the employers to carry on their operations at a loss, neither can they compel the public to buy an article or to build a house at a price which they cannot afford to pay. The wages of mechanics in the Building

Trades have been rapidly raised and are now kept up solely by the constant demand for labour in those trades. The active prosecution of building operations seems somewhat inconsistent with the general depression in almost every other branch of trade. The cause of this apparent anomaly is to be found in the failure of Joint Stock undertakings and the revelations of the Foreign Loans Committee. Until a recent period a large proportion of the savings of the country were being absorbed in the conversion of private manufacturing and trading establishments into corporate undertakings, and large sums were lent to weak and almost unknown Governments, who had succeeded in alluring the too credulous public by the offer of high rates of interest. Experience has shown that Boards of Directors, with little personal interest in their work, and no technical knowledge, cannot take the place of an individual manager having a large stake in the result, and qualified by technical training and long experience to conduct a difficult business. The Joint Stock mania has now happily subsided, and it would be impossible, in the present temper of the public mind, to introduce on the Stock Exchange, with any prospect of success, a loan to a needy Foreign State of the second rank. In the absence of other opportunities for investments, the savings of the country are now being applied to building operations. In the suburbs of the Metropolis and in the environs of our provincial towns, long rows of houses are rising up built with borrowed capital. Timid people, who are afraid of employing their money in more distant operations, are satisfied with the security offered by a mortgage on houses erected in their own neighbourhood. They possess, in the form of a mortgage on buildings, a tangible security, and one the value of which they perfectly understand. Building has accordingly been carried on with unrelaxed energy, and possibly in excess of the wants of the public. Meanwhile, the demand for mechanics and labourers has been sustained at a time when industrial operations generally have been contracted. Thus we see a strike amongst the masons for an advance of wages at a time when the only strikes which are taking place in other trades are strikes against a reduction.

Is the present activity in the building trade likely to continue? This is a question which well merits the attentive consideration of our workmen. Is it not an inevitable consequence of the continued depression of trade, that the savings of the country, which have lately been invested so freely in mortgages on new buildings, must be temporarily reduced in amount? If this be so, the demand for labour will slacken and wages must ultimately fall. It is further to be observed that the depression of trade, which has been so serious in this country, has been still more marked abroad. There are large multitudes of skilled men without employment on the Continent. If they are introduced into this country, the English workman has no more right to complain or to resist than the workmen in France, who quietly suffered my father to take over a body of 5000 English navvies to make the railway from Paris to Rouen. The bricks in the tunnels under the city of Rouen were all laid by London bricklayers.

It was argued at the recent Conferences of the International that, without a combination among the workmen of all nations, there can be no general rise of wages. The country in which production is dear will be driven out of the market by the production of other countries in which work is done at a cheaper rate. The same principle applies to the building as to every other trade. Hitherto, owing to the difficulty of communication, the rates of wages have been determined by local circumstances. Railways have tended to diminish these local inequalities, because the supply of labour can now be drawn from an ever-widening area. In the ship-building yards on the Thames, the great mass of the joiners are Scotchmen, and there is but a slight difference between the wages on the Thames and on the Clyde. It is as easy to introduce masons from Hamburgh as to bring joiners from Scotland. There need be no fear of the competition of foreigners with Englishmen if

only the latter will be true to themselves. All workmen labour at a disadvantage in a foreign country, and I am certain that foreigners will never be allowed to gain a permanent footing in this country. The great evil in the organization of the Building Trades in London has been the substitution of payment by time for payment by results. Piece-work under adequate supervision is the only system which is equitable alike to the employer, the workman, and the public. There can be no objection to mechanics earning 7s. or 8s. a day, provided they have fairly earned their high wages by a just amount of work. The employer will raise no objection to the payment of a liberal scale provided he knows what he will be required to pay, and how much work will be done day by day. On the other hand, it is utterly wrong that good men and bad men should be paid at an uniform rate of 10d. per hour. It is a system which never could have been forced upon the Building Trades but for the unusual scarcity of labour. The depression in trade to which I have already referred may lead to a contraction in building operations, and it would be well that the opportunity should be embraced for setting the relations between employer and employed in the Building Trades on that equitable basis on which business in every other branch of trade has been conducted. No industrial organisation can be sound in which, to use the words of Mr. Herbert Spencer, "duty done and income gained do not go hand in hand, and the failure will be great in proportion as the dependence of income upon duty is remote."

The conclusions to be drawn from our investigation may be laid down as follows:—(I), during the last thirty years there has been an increase in wages of 44 per cent., and in the cost of building of 20 to 30 per cent.; (II.), the advances of wages have been largely absorbed in the enhanced cost of living; (III.), the increase in wages has been caused by unprecedented activity in the building trade; (IV.), the prospect of a more satisfactory organization of the building trades depends on the adoption of an equitable system of payment by piece.

I have narrated the story of the rise of wages in the building trades with strict impartiality. Many of those present regard the trades' unions with a dread which I do not share. I can fully understand why it is that the trades' unions are not viewed with especial favour by the master builders, who have been perpetually thwarted. It is hard to have to yield to the dictation of irresponsible men and to be required to pay wages at rates never contemplated at the time when contracts have been entered into. I sympathise with those who have suffered those losses and vexations, but I must point out that if the unions connected with the building trades have given trouble, it has been the consequence of a great and sustained demand for labour. For years past no skilled mechanic in the metropolis has ever known what it is to be without employment. Our ancient and noble capital has been extended with extraordinary rapidity. Almost everybody, who has been successful in a business or professional career in the provinces or abroad, has crowded into London, and made it year by year, more and more the centre of British society in all its various grades, and a place of meeting for persons of every taste and pursuit, whether artistic, scientific, or literary. The man of pleasure and the severe student can here always find congenial company and gratify their special tastes. It may appear that wages have been advanced under the pressure of the trades' unions, but competition among the masters for labour, of which there was an insufficient supply, has been the primary cause of its enhanced value. If the demand for buildings were to abate in any sensible degree, the price of labour would fall in proportion. The instance which I have quoted at Zurich shows what advances will take place in the price of labour under the same conditions in which the London builders have been placed, and that too in a land of exceptionally cheap labour.

Complaints are urged of the indifference of the trades' unions to the interests of the public. No

doubt those organizations have been established to promote the interests of a class and not for the general good of society; but my experience of the motives and actions of the leaders of the trades' unions has led me to believe that although their energies are concentrated on the single object of improving the position of their clients, they do not seek to promote those objects by violent measures. I attended the late Congress of the trades' unions at Leicester. I was the only man of my own order who did attend, and I can bear testimony to the admirable manner in which the proceedings were conducted. The programme of subjects for discussion was reasonable and appropriate. The questions which it was proposed to ventilate in Parliament were fitting topics for parliamentary debate. There was a creditable freedom from class prejudices. Contrast the proceedings at Leicester with the debates of the International Society on the continent, or the recent demonstrations in New York, where nonsense was talked of a kind which would never have been listened to in this country. Have any of the trades' unions of London ever maintained that, "To protect the useful classes against the avarice of capitalists, or the derangements of trade, the various branches of useful industry should be instituted by the governments upon equitable principles, and thereby furnish employment to those who might be otherwise idle." Has it ever been resolved at a mass meeting in this city, "That the time has arrived for all working people to resist by all legal means the oppression of capital and the robbery which it perpetrates on labour?" My view is that we have in the English working people a body of men less likely to be led away by visionary ideas, less ready to listen to vague and envious denunciations, more strongly influenced by a sense of duty and more law abiding than the corresponding classes in any other country. With all these merits, however, they are not exempt from human infirmity. The principle of self interest is strong with them, as it is with their masters, and it is not always enlightened. They seek to sell their labour to the highest bidder, just as the masters demand the best price, which the very keen competition amongst themselves allows them to secure.

While I have pointed out the inevitable and disastrous consequences of a too aggressive action on the part of the operatives, I am not an advocate of a too acquiescent temper of mind. The industrial capacity of workmen cannot be developed, unless they live in reasonable comfort, in houses in which they take a pride, sustained by adequate sustenance, and encouraged by the prospect of bettering their condition. It is not in countries where the standard of living is lowest, and the pleasures of hope are denied, that production is most rapid and economical. "La pesanteur des charges," said Montesquieu, "produit d'abord le travail; le travail l'accablement; l'accablement l'esprit de paresse."

I conclude with one practical suggestion. The labour problem will find its natural solution in an increased supply of labour. It is for this purpose that a handful of foreigners has been lately introduced; but would it not be more easy and more satisfactory to train up the youth of our own country in greater numbers to be skilled handicraftsmen? It seems to me that the reluctance to perform manual labour is a great and growing evil, an evil which has its origin, not so much in a dislike to hard work, as in that false social system which gives to the man at the desk a higher rank than it accords to him who stands in a fustian jacket at the mason's bench. I am a warm friend to popular education, but let us guard ourselves against its attendant risks. Let us take care that the educational advantages which we are now giving to the people are not perverted.

Mr. Plunkett quotes from the "Philadelphia Times" some very pertinent observations: "What a terrible satire upon our boasted free school system is conveyed in the word 'educated.' Our children have their poor little brains crammed full of all kinds of impossible knowledge of names, and dates, and numbers, and unintelligible rules, till there is absolutely no room left to hold any of the simple truths which former generations deemed more important than all the learning

of the books. The result is that they leave school ignorant of what is most essential, and outside of the schools there is no provision for their learning anything."

It is by a courteous bearing in all the relations of life that the privileged classes can best testify their sense of the real dignity which attaches to honest labour, and show their conviction that the skilful labour of the hands is not inconsistent with culture and refinement.

The PRESIDENT.—Mr. Brassey, as might have been expected, has put into eloquent words the thoughts and ideas which have been seething in our minds for many years past. As you are aware, the Discussion of this Paper will take place on this day fortnight, when I hope we shall have the pleasure of Mr. Brassey's presence, and when, no doubt, the various suggestions that have been laid before us will be criticised and argued with an amount of consideration and care which their importance deserves, and which is, no doubt, Mr. Brassey's object in bringing the subject before us. I will not enter into any detail, but will ask you to express your gratitude to Mr. Brassey for having brought forward in such a masterly way a subject, not only important to us in our daily avocations, but upon which such important consequences depend in the future. I ask you to accord your hearty thanks to Mr. Brassey for his Paper.

The proposition was carried by acclamation.

Mr. BRASSEY.—Mr. President and Gentlemen, I have to express my regret that I was not more punctual in my attendance here this evening, and I am sure, after having heard the Paper read, you will share my own sense of acknowledgment to Messrs. Stephenson and Hunt, to Messrs. Lucas, and to Mr. Howell, for their assistance. Without their co-operation, as I have already said, it would have been impossible for me to put anything before you worthy of your acceptance. I am much obliged to you, Gentlemen, for your kind vote of thanks: I wish I deserved it better. I can truly say that the labour question is a matter of deep interest to me, and perhaps there are few who are more bound by a sense of duty to devote attention to that subject. I wish it were possible to establish at all times perfectly harmonious relations between masters and men. I have always said the fault does not lie entirely on either side. I do not blame either master or man. When we look from a broad point of view, and carry our survey over a sufficient space of time, you see in the case of the building trades of the metropolis the action of those laws of cause and effect—of demand and supply, which Adam Smith pointed out as the determining cause of the rates of wages. This is quite certain—if London had not extended in all directions, and if the public living in those suburbs had not been provided with a network of railways which have recently been erected, the rise of wages would not have been so great as it has been. You say it is trade-unionism that has done this; but if you had not trade-unionism you would have to deal with the same pressure under another form, inasmuch as you have before you the fact that the class of unskilled labourers, the least organized body of workmen, have gained 64 per cent. in wages, whilst the skilled and organized class has only gained 50 per cent. That is to my mind convincing proof that the organization or trade-unionism of the skilled classes of labour has not been the sole cause of the rise of wages. As the subject is to be discussed at your next Meeting, I have only now to thank you for the reception you have accorded to my Paper.

A vote of thanks having been unanimously passed to Mr. Brassey for his Paper, the Meeting adjourned until Monday, the 18th of February, when the Paper will be discussed.

Royal Institute of British Architects.

At an Ordinary Meeting of the Institute, held on Monday Evening, February 18th, 1878,

Mr. GEORGE E. STREET, R.A., Vice-President, in the Chair.

PRELIMINARY PROCEEDINGS.—RESIGNATION OF MR. EASTLAKE.

Mr. STREET said :—It will be known to most of our Members that within the last few days an appointment has taken place at the National Gallery which of necessity deprives us of one of our most useful and efficient officers, Mr. Charles L. Eastlake, who to-day has resigned into the hands of the Council the Secretaryship he has held for eleven years. It is a most remarkable fact that during that period he has never failed to attend one single Meeting, either of the Council, the Standing Committees, or of the General Body of Members in this Room, and his industry is known to all those who have served upon the Council. I will not say more at the present moment than to read you the copy of the Resolution which has been unanimously passed by your Council to-day in reference to his services. It runs as follows :—

> "That the Council of the Royal Institute of British Architects cannot allow Mr. Eastlake's resignation to be accepted without recording their regret at their own loss, and their warm thanks to him for the industry, skill and courtesy which he has invariably shown during the eleven years of his service as Secretary. At the same time they congratulate him heartily on his appointment to the Keepership of the National Gallery."

I will only add that if Mr. Eastlake brings to his new duties the same zeal, success, energy and tact with which he has served the Institute of British Architects, the trustees of the National Gallery and the public will have no reason to regret his appointment.

Mr. EASTLAKE, who was cheered on rising, said :—Gentlemen, I thank you sincerely for the kind manner in which you have received the announcement just made from the Chair. The appointment which the Prime Minister has been pleased to confer upon me is one which, on personal grounds of taste and inclination, as well as from family associations, I need scarcely say, has been highly gratifying to myself; but if anything could enhance the pleasure which I felt when I accepted the appointment, it was the hope—perhaps I may venture to say, the conviction—that in quitting the service of this Institute, after eleven years of official work, I should carry with me the good wishes of so many of its members whom I am glad to call my friends. I am unwilling to delay for a single instant longer than is necessary the Discussion which is to take place this evening on Mr. Brassey's interesting Paper. I will, therefore, only say that in giving the Council notice of my resignation as your Secretary, I begged them to consider my services at their disposal so far as possible until my successor is appointed; and I therefore promise myself the pleasure of meeting you again on more than one occasion in this room before taking my final leave.

The CHAIRMAN.—It will be necessary to nominate a successor to Mr. Eastlake, and the Council have desired me to state publicly that applications should be sent in before the 4th of March next, and that in the meantime Mr. Eastlake is instructed to tell candidates who may apply to him exactly what the duties are, and what are the conditions under which the appointment will have to be taken. Under the Bye-laws it is necessary that the Secretary should be a Fellow of the Institute.

We will now pass to the Discussion of Mr. Brassey's Paper "On the Rise of Wages in the Building Trades of London."

DISCUSSION ON MR. BRASSEY'S PAPER—THE RISE OF WAGES IN THE BUILDING TRADES OF LONDON.

The CHAIRMAN (Mr. G. E. Street, R.A.), in opening the Discussion on Mr. Brassey's Paper, said:—I am sorry to find that Mr. Brassey is unable to be here to-night in order to share in the Discussion. I daresay we have a good many strangers who are not members of the Institute, and in order to facilitate the wish of any who may desire to join in the Discussion, I will ask them to send up their cards, and I will call upon them in the order in which they do so. We have Mr. George Howell present, from whom Mr. Brassey obtained some valuable statistics; and perhaps, if he has no objection, he will, as a representative of the working-classes, open the Discussion.

Mr. GEORGE HOWELL.—I did not expect to be called upon to open the Discussion. I thought that opportunity would fall to some member of the Institute. I certainly did give Mr. Brassey a number of facts for his Paper, and he has acknowledged that I did my best to give them exactly as they were, so that the Institute might be able to come to a proper conclusion. It seems to me there is not a better body in London to deal with this question than architects: they hold, as it were, a neutral position between builders and contractors on the one side, and the men upon the other. With regard to the facts of the Paper, their accuracy has been acknowledged by the architects and by a large building firm to whom they were referred, so that it will not be necessary to go into them. There are one or two clerical errors, which I will hand to the Secretary, but they are not important. The more important point that arose out of Mr. Brassey's Paper was the alleged want of earnestness on the part of the men at their work. Now, Sir, it will not be necessary to enter into a long argument to prove that a large part of this dispute turns upon piece-work. The architects of London know full well that in building operations it is almost impossible to apply the principle of piece-work throughout a building. There are certain departments in which it can be applied; but I ask any architect who knows anything of his business, how it is possible to apply the principle of piece-work with regard to the brick-work of large buildings? There may be instances in which it may be applied, such as arches; but to apply the principle of piece-work, or task work, or anything of that kind, it must assume the particular form of a number of men combining, and taking a portion of the work and dividing the profits among them. Absolute piece-work—that is to say, each man doing his own work and receiving payment for his portion—is next to impossible in many operations of the building trade, and particularly in regard to the bricklayers' part of it. It can be done to a certain extent with the masons and amongst the joiners, but taking the building trade throughout there are many difficulties in the way of its application which cannot be got over. I contend that the principle of piece-work can only be applied where the man can bring his own energies to bear upon the work, or a particular portion of it, and complete that work by himself. He is then responsible to himself alone for the amount of work done, and to the master for the way in which it is done. A tailor and a shoemaker can do this, and in some parts of the building trade it can be done also; but many of the difficulties on the part of workmen with regard to piece-work, so far as I have been able to understand them, have arisen from the difficulty of applying the principle throughout the building. I have had experience both as a man and as a foreman, and to some little extent as a master, but I have not yet been able to see my way clear to the application of the principle of piece-work during

the entire progress of the building. I will now go to the other question, which, I think, is one of the most disastrous allegations that is, or can be, made against the British workman—viz., that he skulks at his work, and does not endeavour to give a fair equivalent for the wages he receives. Now, Sir, I am prepared to admit that there is in human nature (and I am afraid that applies to all human nature, and not particularly to the working-man) the desire to get as much money as possible for as little work as possible. Every man in his own particular way strives to get as much money as he can for the least amount of work. Allow me to explain. It depends entirely upon the way you apply that principle. If a man has a certain amount of work allotted to him, and he shirks it, and still tries to grasp the money for it, it will not apply universally, but in the broader sense it does. What I deny is, that this statement, in the sense in which it is used against the working-men of this country is untrue with regard to them, just as much as it is untrue with regard to all other classes of the community. The difficulty of testing what amount of work a man should do is not a small one. Take the occupation of brick-laying. A great number of people with whom I come in contact have got hold of a notion that the proper number of bricks for a bricklayer to lay per day is a thousand, and that he ought to do that each day. I need not say to any practical man, whether builder or architect, that in some cases a bricklayer can do this without great pressure, but that in others he cannot. It would, in some cases, be harder work, in the more complicated parts of a building, to lay three hundred bricks, than a thousand in others. Everything depends upon where they have to be laid, and the style in which the work has to be done. The difficulty of guaging the amount of work is so great that much misapprehension has arisen. When collecting these facts for Mr. Brassey, I talked to a number of men as to the amount of work done by individuals twenty-five and thirty years ago and now, and the answer I have had in almost all cases with regard to skilled men has been, that their work to-day in quantity and quality will bear comparison with that done at any former period of their history. The only exception has been where there has been a kind of nigger-driving, such as that formerly practised in the outlying districts by persons called "sloggers" and "jerry-builders." There was a time when a few men were paid sixpence per day to "run" the other men, so as to cause them to run up a certain quantity of work in a given time, but that has been abandoned. The men to-day are usually allotted their work according to their trades, and I venture to say further—and I say it in the presence of men who are competent to judge—that if the workmen of London do not do their duty to-day, the fault is not so much with them as with the incompetent foremen put over them, although even this is not so general as it used to be. A foreman should know the quantity of work that every man should do, and the aggregate amount of work that the men combined should do; and it is his duty to see that every man is put in his proper place. If the men are properly arranged in places suited to their special skill and ability, I venture to say to-day that the men will be able to do as much work, and would do it as well, as they have ever done at any former period of their history. With regard to the particular fact stated by Mr. Brassey that occurred at York—I do not wish to say one word that may be construed as disrespectful to the gentleman who supplied that statement—but I venture to say that it is very difficult indeed for a body of gentlemen, upon an *ex parte* statement such as that, to come to any definite or proper conclusion. There are many circumstances that would have to be taken into consideration, and it would be necessary for a man competent to judge to know the details before coming to a proper decision. Why, Sir, I have had to test a great number of those conclusions printed by Mr. Greg, Mr. Thornton, and other gentlemen, with regard to trades' unions, and I venture to say that ninety-nine out of every hundred of the allegations made against these societies are not true in the sense in which they are stated. I say that after having examined them.

Here is one of them, quoted by Mr. Greg and Mr. Thornton, and bandied about all over the country with regard to laying bricks with both hands. Why, it has been a matter of wonder to me how any body of men, or how any single man with any knowledge whatever of building operations, could talk about "one-handed bricklayers;" and yet *Capital and Labour* printed some absurd story, taken from an American paper, on this subject of "one-handed bricklayers." What is the absolute fact? Practically it is as difficult for a man to lay bricks with both hands as it is for a clerk to write with both hands. It is only in very few instances that a man is able to lay down his trowel and take up the bricks with both hands, and that is on wide walls, footings, and the like; where he can do this, there is no rule against it. Supposing he were eternally in the habit of putting down his trowel and of taking up the bricks with both hands, those of you who have never handled a trowel except in kid gloves know little of the result. Bricks are hard and gritty, and not only so, but it is necessary to have them thoroughly saturated with water, especially in walls where cement has to be used. Now, the inevitable result would be this, that in course of time the thumb and fingers of the hand which has to hold the trowel would become so chapped that his thumb would be nearly useless. He then could not easily go on with his work, and the result would be that instead of gaining in quantity he would lose in quantity and correspondingly in skill also. The difficulties of putting down and taking up the trowel are small things in themselves; but a practical man knows them, and he will smile at the absurdity of such an allegation against the trades' unions. I do not mean to say that trades' unions have not some stupid rules: in the past many stupid rules have been got rid of; but let us attack the rules that are absurd, and not waste our time in going off into side issues.

Mr. SAMUEL HILL, Visitor.—As the author of a Paper on "The Freedom of the Labour Market," which I had the honour to read in the Grand Jury Room of St. George's Hall, Liverpool, before the Historic Society of Lancashire and Cheshire, when the late Sir William Brown, Bart., M.P., presided, I venture now to make a few remarks. In that Paper I ventured to make allusion to the strike of the operative masons when that magnificent pile, the Law Courts of Liverpool, was being erected, and I made bold to state that that strike contributed to the failure of the contractors for the masonry. I am sure that it is a very important question for the members of trades' unions to consider whether it is not desirable that something like fair play should be shown as towards masters by men. As a Lancashire man I am a great admirer of fair play, and I believe there should be more consideration for the masters shown than has hitherto been the case. It is quite true that capital can do nothing without labour, but it is capital that calls labour into exercise—the designer (such as our worthy Chairman) to plan, and the skilful hand to execute. If we thought more and strove more for the union of capital and labour, and accomplished it, I believe that the interests of this country in a commercial sense would be fully maintained. As regards the rise of wages in the building trade, you must not forget that there is an important factor which has been altogether ignored here, and that is the lessened purchasing value of money. You are well aware that in the present day you cannot lay out a sovereign as you did a quarter of a century ago. Perhaps clothing may be a little cheaper, but articles of consumption and rents are dearer; and these prices are not regulated as the members of trades' unions attempt to regulate their prices, by artificial regulations or restrictions of their own. They are the result of the universal law of supply and demand. You may as well try and make water go up a hill without hydraulic pressure as to cause wages to rise unless there is a demand for the labour that earns them. In 1859 there was a strike of the builders in London; and, if you will permit me, I will read you a few extracts from my Paper referred to:—

"A principle to be just and equitable, the converse of it must hold good; and is it reasonable to expect such a

total abnegation of self-interest on the part of the hirer required in his contract to pay a fixed and uniform rate of wages, determined by a small clique, irrespective of the ability of the men, or the state of the labour market at the time, which, like all others, ought to be regulated by the universal law of supply and demand, when the hired are at liberty to transfer their industry where, and in many cases when, they choose, or with a very brief notice?

"The egregious impropriety of this is apparent if duly reflected upon, and how often the period selected for a strike is when the employer is saddled with a heavy contract, extending over a long space, and taken on the basis of a fair steady rate of wages, and, in addition, materials rising, with a certainty of a penalty being incurred if not fulfilled in the stipulated time."

I have taken a great interest for many years in the welfare of working-men, for I am the son of a working-man, and having been at the bench in my native town of Preston in my early youth, I may claim to speak with some knowledge of the question. I remember, when a lad of seven years, on going to school, I was attracted by a demonstration in Canal Street, Preston, and it turned out to be a lot of people coming out on strike. They were crying out against improvements in the machinery for cotton-spinning—the self-acting mule—forgetting that "necessity is the mother of invention." That is a lesson to those in our day whose tendency is to work in the inverse ratio of the amount of their earnings. The more you pay a man beyond what is his legitimate value—because there are bricklayers and bricklayers—the more you outrage every true principle of political economy. There are men who are skilled, and who are entitled to good wages; but an attempt at levelling will be disastrous in every respect.

"It is notorious to every watchful reader, that combinations or strikes can almost be invariably traced to the acts of an individual called the secretary of a club, or trades' union, whose word is law; and when his fiat has gone forth, none of its members dare say, 'What does thou?' If proof be needed on this head, I will quote the manifesto dated 25th July, 1859, of Mr. George Potter, Secretary of the London Operatives Building Trades, viz.:—

"'The Master Builders having refused to concede the nine hours as a day's work, the Conference of the United Building Trades have been directed by the members of the movement to call upon a firm to cease work. Having done so, they now appeal to you to aid them in supporting the men now on strike at Messrs. Trollope and Sons. It is earnestly hoped that no workman will go in to supplant them till they have obtained their object—"'It is expected that every man will do his duty."'

"So far as the great body of the building operatives were concerned, they were ignorant of the parties whom they were called upon to obey, as shadowed forth in the document just read, nor has it yet publicly transpired who were the members of this secret conclave. The object of the strike, to get ten hours' pay for nine hours' work and to give additional employment, is too fresh in your memories to demand from me more than a passing notice."

What I would recommend is, that you should teach the children in our elementary schools the principles of political economy. I trust that working-men will reconsider their position. I who have pleaded the cause of charity in the Metropolis and elsewhere, tell you that charity is twice blessed: "it blesseth him who gives and him who takes;" but I would say distinctly that the £150 taken on Saturday by the operative masons on strike from the Bricklayers' Union could not have a blessing attached to it. It was a premium, not to idleness, but to neglect of work. I believe there is a dignity in labour, and the more you labour the more you will conduce to the greatness of this country, and the more you will promote your own moral worth and comfort.

Mr. Horace Jones, Fellow.—I regret not to have been present on the last evening, when Mr. Brassey's Paper was read, but in the interval I have had the pleasure of perusing it; and, whilst there is much in it that one cannot help appreciating and admiring, yet it is not so perfect as I expected it would be from Mr. Brassey's well known talent. He seems to have been hardly the physician who sees the cause of the disease, and relieves if not cures the patient. One of the speakers struck a very important key-note when he spoke of the enhanced price of provisions, but even he omitted the importation of gold and silver which is a factor in this question. Now between 1865 and 1875 there has been an accumulation of bullion, of gold and of silver, in the country of between £40,000,000 and £50,000,000, and that must necessarily give some increased price to almost

every article. A great many articles have been kept down in price by the application of machinery, which often utilized the labourer at the expense of skilled workman; but it is a natural thing that the workman should have his wages increased, and we know how liberal contractors are. They are always liberal enough to put 25 per cent. upon the men's wages without being asked for it; and I have no doubt that is the origin of strikes. There is another thing that need never have occurred if something like the old spirit prevailed which used to animate the master tradesman of fifty or sixty years ago. He had two or three apprentices, skilled workmen, in his own trade, who in all probability he paid weekly, whether in good work or in bad, fine weather or foul weather, all the year round; and with half a dozen of this class of men and his sons, and two or three apprentices, he readily defied any strike. It is this class of men, and none more likely, that must have carried out the designs of such architects as Sir William Chambers and Sir Christopher Wren, for the names of master masons and plasterers, &c., are found in books of the period relating to these works, because in that day they did not occupy the ignoble position in their craft that they do in ours. There was one point that occurred to me in listening to Mr. Howell, and that was as to the motives with which men labour. I have faith enough to believe that many go about their work with a feeling quite irrespective of what they are to be paid when it is done. Some men, I thoroughly believe, do their work fairly and properly. There is one peculiarity I should like to mention, which is this: that though there is an importation during these fifteen years of so large an amount of gold, there has been no corresponding increase of taxation between 1865 and 1875. In the former year the rate was £2. 10s. per head, and in the latter £2. 10s. 5d.

Mr. GEORGE POTTER, Visitor.—Before I come to the Paper read by Mr. Brassey, I should like to say a few words in reply to the gentleman whose opinions have been so generally endorsed in this room—Mr. Hill. By what he says it would appear that working men are always trying to secure rights for themselves regardless of the rights of others, and he gives you an example which fortunately, I suppose, it happens I am here to listen to. He tells you how the great Lock-Out occurred in 1859 through one man, and that man myself. It is well that he should be corrected in this mistake, because I am sure there are many here who know very different. (The statement of Mr. Hill is embodied in what he read.) Although I played a humble part in that Lock-Out, yet it only occurred after due deliberation through every branch of the building trade. Two alternatives were presented—either to cease work or continue work. A large majority of the building operatives through their delegates declared in favour of ceasing work. I, with many of the other leading delegates, was opposed to that and urged as far as we could the advisability of continuing to work until a proper settlement might be made. So much for the Great Lock-Out of 1859 taking place through the dictation of one man and that man myself. [Mr. HILL.—Was not your signature attached to any document?] [The CHAIRMAN.—I hope you will abstain from personal remarks.] I do not wish to throw any acrimony into this Discussion, but when it goes forth that I was the cause of that strike twenty years ago, I think the actual facts should be stated. In the same way it is quite right that a body of British Architects should understand that it is not true, and that no strike can occur of any magnitude without the sanction of the trade in which the strike takes place. It is not in the power of any Secretary or any officer to create a great strike. I hope that misstatement, now that it has been corrected, will never be repeated, because it is likely to mislead those who want amicably to arrange the differences between capital and labour. The question is too great to be led away by such one-sided statements. Now, Mr. President, there is very much in Mr. Brassey's Paper that we can all agree upon. He is a man who has given considerable attention to this matter and able to give an opinion, because he always tries to speak without prejudice. But

we must always remember that there are two stand-points to the question: the one that of the capitalist and the other that looked at from the side of labour. Through these two stand-points, of course, the questions are generally decided. Now it is not correct to say that trades' unions are opposed to capital. You never hear any of the leading men amongst them denouncing capital. Unwise things may be said to that effect, but they are not correct. It is necessary that capital should exist and that labour should work for it and share the rewards produced by the united result. All difference arises on the point of what share of that result should go to capital and what to labour. You have mentioned that within the last thirty years the wages of the building operatives have advanced 44 per cent. I do not think that is a very exorbitant advance. If you trace out the facts you will find that in the same period capital has gone up 250 per cent. and therefore the other advance of 44 per cent. is not an unreasonable one. We must never forget that the men have as much desire to get as much as they can for as good work as they can do, as the master has to get a good profit for his outlay. The question is, as I said before, What is the fair profit and what is the fair wage? Is it to be supposed that the workmen should remain to-day as they were thirty years ago? Would the architects be as satisfied as they are with their work? Certainly not. I consider that the improvement which has taken place among the building operatives must be as much calculated to benefit the capitalist and employer as it is to benefit the workmen themselves. As to the employers' interests being more neglected—I maintain the contrary. You charge us with suggesting that every man should be paid alike: nothing of the kind is done. The trades' unionists are in a minority, and in fixing a minimum they find that men outside can work for whatever wages they like, and there is not a master builder or architect but knows that in the building trade there are a great many men who work under 9d. an hour, which is the minimum as it is also the maximum. It is seldom, you know, that a master pays more than the minimum price to a skilled artizan. What I want to enforce upon the Meeting is this, that the master builders always know the best men and are willing to take them at the minimum price. It is far more profitable to have a good workman at 9d. than an inferior man at 7d. or 8d. Everybody knows now, that when it is represented that we desire all to be paid alike, it is a fallacy. Mr. Howell very forcibly put the question of piece-work and showed that in many branches of the building trade it is impracticable. Joiners can do it, as for example, in making sashes, of which when finished those engaged upon them can divide the proceeds. But here is the point, that if it is found they have earned too much they must do the next job cheaper, or they must go back to day work, when they will be expected to do as much as when working might and main, having a prospective benefit in view for themselves. Hence two practical evils evidently arise out of that—either reduced wages and harder work, or more work expected from the day time system. Consequently where piece-work is taken up it ought to be on a fixed scale, that shall not be altered by the will of the foreman or the desire of the employer. Now a word about overtime. I have worked in a shop when I have at last actually gone to sleep upon the shavings, working from five in the morning to eleven at night, and whilst I was sleeping my employer had to pay me. Was that right? and there were scores of men in the same case. I say overtime was unprofitable to the master, a curse to the man, and a nuisance to society, and therefore in doing away with systematic overtime we hit a blow at a bad system. When you look at the differences between masters and men you must understand that it is not always the men who are in the wrong. Why don't you tell us something about the extraordinary differences of the contracts of master builders. You tell us of the differences in wages—why not in this. Look at the great job now in progress—the Law Courts. We all know that the highest estimate was £1,000,000, and that the lowest was £720,000—nearly £300,000 less, and the man is now

executing the contract. If the man could do that and pay fair wages and find good materials, and have the work profitably done to himself, what must have been the man's profit upon the million sterling? Taking a smaller case—the building of a Board School for £10,000, I find there is a difference of £2,000 in one estimate. One man will do it for £10,000, another for £8,000. If the lowest can give good wages and find proper material, then I say it is right we should understand where the difference is. I quite agree with Mr. Jones that the old relations between masters and men are dying out. When I first came to London one master might only do one branch of the building trade and employ a few men and apprentices and pay them what they were worth. Now you have giant firms that override the small builder, and they pay foremen and middle men to come between employer and employed, putting man against man, set one part of society against the other, and then you complain of the evils this sort of thing creates. Surely if the old system of relationship between master and man has disappeared, the day system destroyed, the hour and minute contract introduced, upon what understanding, I ask, will the future work of this country be carried on? Let me tell you that honest English artizans do not desire to oppose their masters, or vex, or annoy them. They are, as far as I know them, willing to work as well as they can, but they desire some small advantages from the great increase of wealth and the great progress of civilization. These are the reasons why the men try to get their labour dignified, their homes comfortable and happy, and themselves physically strong, artistically trained, and technically educated, to enable them to execute their work in a satisfactory manner to their employer and with advantage to their country.

Mr. LUCAS, Visitor.—I should be sorry to say one word against the operatives. We have profited largely by them, and they, as a rule, have behaved extremely well to us, and it is only from the sense of duty I feel towards you and towards the public that induced my firm to supply Mr. Brassey with the information he called upon us to give. That information has not been disputed. All Messrs. Howell and Potter may say, if they talked till Doomsday, will not alter the fact that the men do not now do a day's work. Mr. Howell has suggested that the cause of the small amount of work at York was probably due to a bad foreman. Now I have only to mention the name of that foreman—Mr. Clemence, one of the most able men of his class, and who has satisfactorily carried out many of the largest works that we have ever undertaken—to show you that in this supposition Mr. Howell is mistaken. [Mr. HOWELL.—I did not refer to him personally.] Not to him personally, but to the foreman. No doubt, it is a painful thing to Mr. Howell and to Mr. Potter to have to disclose this, but not more painful than it has been to me; but still the information that I give to Mr. Brassey, I am bound by, and am prepared to prove, even though it may appear to you, as it did to me, past belief. It is not only that it refers to the particular work under consideration, but to all out-door work in the building trade—not shop work, because as you well understand, the great bulk of work in the shops is done by machinery; neither does it refer to engineering works. Now Mr. Howell talks of being a working man, and Mr. Potter does the same; but, gentlemen, I would ask,—what am I but a working man? I began life as your President, Mr. Barry, well knows, working for six shillings per week. I never had a shilling but what I worked for, and I attained my present position step by step, by using such ability as I had to the utmost, and by making the best friends I could of my employers. But whatever ability a man may have for his business, and whatever his sense of honour, and however desirous he may be to become a man amongst men, I defy him to rise to such a position under the rules and regulations of trades' unions. It may seem like an attempt to speak boastingly, although nothing could be further from my wish, but I do not hesitate to say that my position has been made by my own energy, and by my own freedom of labour. I have given you,

through Mr. Brassey, a statement showing the cost of labour and work done, when at 6d. per hour, and the cost at its present rate of 9d., and the result which is arrived at from books, most accurately and carefully kept, and to an examination of which I invite any of your Council, is broadly that there is now little more than half the work done for 9d. than there was formerly done for 6d.—a fact which I am prepared to prove. The only way, in my opinion, to adjust this is by the use of additional machinery and by piece-work. I do not for a moment desire to run down the value or the rate of labour. It is perfectly immaterial to the master what he pays a man, provided the public will repay him (the master) for it. But will the public do this? You are told by one of their own spokesmen that it is natural for all men to do as little as they can, but I deny Mr. Howell's assertion, that it is the feeling of all men to do as little as possible for the largest sum of money they can get. I feel that I owe my success in life to the great industry and to the good example of my parents. They never allowed their children to be idle, but I maintain that this is now the system with the workmen—and what an example for their children for the next generation—to do as little as they can for as large a sum of money as they can obtain, and for the shortest period of time! I should like to put this to the wives of the men—and it is an exact simile. What would a woman think if she went to a baker's shop for a quartern loaf, and found that its cost was 9d. instead of 6d.; and not only that, but that they gave her a half quartern instead of a quartern for her 9d.? That is practically the case with us. We pay more and get less, and in these proportions. I quite agree with Mr. Potter, and I think his proposition a reasonable one, that piece-work should be set at a price that the men can well earn good wages and live. I do not know that the Council of the Institute of British Architects could be better employed with the assistance of their experts, the surveyors, if they would do so, than in framing, as between the masters and the men, what would be fair prices for labour. Let me assure Mr. Howell and Mr. Potter that I will give them all I receive from you for labour, less ten per cent. for my capital and risk, and for my personal attention to the business. I venture to say that the employers are the best friends of the men. No firm in the trade has employed more men than we have done, and neither my brother nor myself ever said or did an unkind thing to a workman. We have always endeavoured to treat them in the best possible manner. I will give you an instance of the prejudicial effect of all this upon brick-working and masonry. The moment a man gets to a point when you cannot get anything fair from him the profession will set their wits to work as to how they can best do without him. My firm is now carrying out a large dock, the walls of which would formerly have been built in brick-work and stone-work. At present we are using upwards of half a million yards of concrete in the place of brick and stone. What does this mean? It means a million in money of brick-work, or £2,000,000 of masonry lost to the workmen. It is all done in concrete, and so it will go on. We have a work adjoining the Charing Cross Railway Station, where it was intended to use a quantity of stone, all of which has now been done away with. I am quite sure that no professional man would wish to have a stucco front, which, as a rule, is done either to save money or to cover over some scamping brick-work, if he could use stone—and why cannot he? Because the cost of labour is so enormous. No doubt this difficulty will be met, as in the case of joiner's work, by the introduction of more and more labour-saving machinery; but what I want to impress upon the men and their representatives is, that it is utterly impossible,—I do not care who the master is, and no one can be more anxious for the welfare of the men than myself—that things can go on if third parties are allowed to interfere between masters and men. It is just like a third person coming and dictating between man and wife. Constant interference produces constant ill-feeling and quarrelling. The same thing applies to the interference of the leaders of trades' unions. You never know where

you are. If you can settle what is a day's fair work, keep to that by all means. I do not care if it is a sovereign, neither will the public, if they get value for their money, but I do not hesitate to tell Messrs. Howell and Potter that the public feel that they are not getting value received, and that this must therefore end in the stoppage of works. Mr. Howell suggested that it was all nonsense about men using two hands to their bricks, but it is not nonsense, for I know it to be a fact. Mr. Potter also asserted that it was all nonsense about the men having the same rate of wages—I know it is not nonsense, as I know this also to be a fact. They do claim the same rate, and instead of 9d. being the minimum, it was agreed by masters and men together that it should be the maximum for first class hands. It is unfair as an all-round scale. I am very glad to find that they are ashamed of this and have withdrawn it—if it is withdrawn. The idea of keeping men at the same rate does not mean bringing the bad to the level of the good, but the good to the level of the bad. I do not hesitate to assert that there are as good mechanics in this country as any where in the world, but the men must put their confidence in their employers in the same way that we do in those from whom we obtain our contracts, and the men must in a measure be led by us. With regard to the cost of their labour, I have stated that I am quite prepared on behalf of my firm to give them all that I receive for their labour, less ten per cent. for the interest of my capital and risk, and for my personal attention to the work. If not satisfied with that, then I would suggest to Messrs. Howell and Potter—and they have enormous influence over working men—that it would be wiser and better, instead of sacrificing an enormous amount of money in these constant strikes, and if you think you are not getting a fair share of our profits, to form a co-operative building society of your own? You might become masters, and I will venture to say that you would not be in business a month before you would upset your trades' union rules. So far from opposing you, I would help you to try what you could do. I assert boldly and fearlessly that the masters, as a rule, know too well the value of good men not to treat them fairly and properly, and it is the desire of the masters to pay them not only liberally but handsomely. At the same time they must get a fair return for their money, and in the building trade this applies as well as in everything else. It is stated that there is a great danger that piece-work may be "scamped," but that is a matter of supervision. I do not think it is dignified of the men to say that it will be "scamped," for they must be scamps who scamp it. I do not believe it would be more scamped than it is now. The difficulty that we have is the unfair position we are placed in. I know—and no one knows better—that we cannot estimate the cost of labour. We cannot contract for it without putting on such an enormous margin that will either lose us the contract, or in all probability, if that margin is absorbed, will be doing an injustice to the public. I think that it ought to be known, and it is very simple to a man who understands his business, what is the fair day's work for a man to do. Mr. Howell suggested that a man in a day will place a certain number of bricks. I can go round with any of my people and say "I think that work is worth three guineas a rod," but we have had to discharge men because it has cost about £5 a rod, and this the most simple kind of work—the result being simply astonishing. This is known even to householders. Sir Henry Hunt spoke to me about it, and expressed very much the same opinion, that he could not now justify the cost of the work with the labour. I do not think we have sent out an account this year in which we could justify the cost of labour included in that account. That is a painful thing for me to assert, and I thoroughly believe that Mr. Potter knows it to be true. [Mr. POTTER.—You ought not to say that]. No doubt there has been a great success in our trade; we know that half London, with its suburbs, has been rebuilt within recent times. Look also at the great engineering works and railroads, and the enormous amount of business, all created and carried out during our own time; but I want to warn the men that these

works, although they have not come to an end, are not what they have been. It is not for them now to trifle with the public, although we admit that they ought to receive every consideration. They should have a fair share of the profits with their masters, but it ought to be settled what is a fair day's work and what is a fair day's wages. I am sure that every employer wishes to pay them fairly, but to continue as we are going on now is utterly impossible. What has kept up the enormous cost of provisions? Why, it is clear to my mind—the enormous cost of labour—and it is those with fixed incomes who feel the burden. It is not the builders and the men who have had all the advantage of this increased cost and wage. If you persuade a ploughman that he should not plough so much land, and that he should demand more money for the lesser quantity of work, of course the cost of provisions must rise. I venture to lay before the men in all kindness, and with the best possible feeling, that it is to our mutual interest to adopt piece-work, provided that we can agree to a fair price, and that all piece-work, when done, should be well done, and a credit all round, and let me pay such a price that the men may feel a pride in their work, and turn round to a "scamper" and say, "Be off, or we will expose you." That is the tone and feeling there ought to exist amongst working-men. That was the tone and feeling when I was young. I have worked as hard as any of you, and I defy any man in the union or outside it to say that I have not been a kind and considerate master. I am prepared to give them a fair share of the profit, and nothing distresses me now more than to see the error they have run into. My remarks do not apply to a large number of men in my employ. I have a very large number who have been with me from the time they were boys, and now they are getting old men, and their sons are in the firm and doing well. On our large engineering works we have no difficulty in getting the work done. I have never attempted to screw a man down because he has earned too much. If he has made the best use of his time he deserves his reward. As to the hours of labour, there is no firm, perhaps, more responsible for their shortening than mine. I thought it was desirable to let the men work only nine hours, and I am prepared to say I made a mistake. I judged the men by myself, and thought that if they had a half-holiday and an hour less to work each day, they would work with increased will during the remainder of the time, but it has not proved so, and I do feel very strongly that it has been a mistake, both for the masters and for the men, and also for the public, to knock off work in the summer time, which is the only time we can work on certain out-door buildings. I am prepared to give my men the same rate of wages in the winter time and shorter hours if they take full advantage of the summer. If I consider them in this way, I do not think it is unreasonable to expect that they should consider me in return. If I have said one unkind word about the men I have not intended to do so: I have spoken with a sense of duty and more in their interest than my own. I have now arrived at a position that it will affect few men less than myself what decision they may come to, but with all friendship and affection I give them the advice I give to my own boys "While you do work, work well, and what you do, do well."

Mr. I'Anson, Fellow.—This Discussion has been very instructive. The temperate way in which Mr. Howell and Mr. Potter made their remarks struck me very much. Mr. Potter admitted that trades' unions had indulged in fallacies and errors which they are learning now to put on one side. I can't agree with him in reference to the question of piece-work. I have seen a great deal of brick-work executed and I can't conceive any work more capable of being done on piece-work than brick-work. As regards Mr. Potter I can't but admire much the sentiments which appeared to actuate him, but he is too theoretical. No doubt it is the combination of capital and labour which produces all our great work, and if it were possible to exactly adjust what each party should take—as his share of profit—that no doubt would be the right way of adjusting it, but that is extremely difficult and

quite theoretical. Now the practical solution is the supply and demand, I think there is no better illustration of the power of supply and demand than in the case of the labour of domestic servants, which is familiar to us all. There has been no strike among them and their wages have increased certainly 50 per cent. within thirty years. It is simply a question of supply and demand. If you want servants you know the difficulty of getting them, and the wages you must now pay them —especially good ones—and the pay is in proportion to their efficiency. I do not ask the men, neither do I counsel them, to trust altogether to their employers. They might trust to the benevolence of such a master as the gentleman who has just sat down, but I ask them to trust to themselves. They have a perfect right to get the best wages they can for their work, but it is an utter fallacy to create rules which bring all men down to the same level, and Mr. Potter didn't contradict this. [Mr. POTTER.—We all contradict it.] Then that is a most satisfactory declaration to hear expressed in this room. Everyone present must be gratified to hear that. [Mr. HOWELL.—There is no such rule in any trades' union in the Kingdom. Mr. POTTER.—We do not care how much you pay a man. We do not fix his wages.] I heard an Alderman of the City of London, one of the Delegates to the Philadelphia Exhibition, who was interested principally in the stationery trade, and he came back impressed with the feeling that our stationery manufacture was leaving England for America. The wages are higher, but there are no restrictions. A man may work as long as he likes and as much as he likes, and it is the absence of these restrictions that is enabling that country to supersede us in that branch of the trade. For the first time it seems to me that the masters have been taking quite the right course in the masons' strike. They have not refused the men in any way. They have simply found the men would not work for what they consider a price remunerative to themselves, and they have exercised their unquestionable right to get their labour from elsewhere. The whole world belongs to us. We may invite other workmen here. The world is ours, and throughout the whole civilized world we have a perfect right to get our labour in the cheapest way we can. [A VOICE.—The workmen will emigrate.] Then it comes to a question of supply and demand. If the masters can't obtain labour cheaper abroad they must simply pay the wages the home people demand, and I do not blame the men for getting them; but do not let them obstruct other men who are willing to come and do just as good a day's work, nor let them impose rules which make all men equal. Let there be free trade in labour on the part of the men as much as on the part of the masters. That is I think the right principle, and I hope and believe that that principle has prevailed in the late strike, and that we shall hear no more of the masons striking.

Lord HOUGHTON, D.C.L., &c., Hon. Associate:—I have had the honour before of meeting Mr. Potter upon one interesting occasion in which there was a Committee appointed by the British Association to determine as far as possible upon scientific grounds the relations of capital to labour. We issued a little tract upon the subject which was the result of our investigation. We had the pleasure of meeting gentlemen of the same order of thought, including Mr. Lloyd Jones and others—most intelligent men who understood the subject perfectly, and we had more than once the opportunity of distinct conference between the persons powerfully representing the other side. The saddest part of that investigation, I think, was this, that those gentlemen produced the same arguments without being able to support them by any considerable amount of new facts. What I mean by new facts is this: they were not able to show us that these continuous strikes which have taken place throughout this great commercial country can be said to have paid themselves. When we consider the immense amount of money that has been sacrified in these strikes, and what is much more unsatisfactory, the enormous amount of loss among the people which has been brought about by this enforced abstinence

from labour, we come to the conclusion that although there must have been, and no doubt has been, a very considerable and legitimate increase of the profits of labour in several trades and professions, yet nevertheless there is every reason to believe much the same amount would have accrued if those agitations had not existed. I have no word to say in relation to the immediate effect of the masons' strike, further than that in my own sphere of life I do see the greatest disinclination of persons to spend money upon subjects connected with building in consequence of the uncertainty brought about by strikes. The warning which has been given us is a very serious one, and I think it is more serious than could have been understood by the last speaker, when he spoke of the importation of foreign labour. Mr. Street, our chairman, knows well enough what the relations are of foreign labour and how difficult it is to acclimatise that labour. There is a difficulty about it which will always be very great, and I do not think that much benefit will arise in that direction. I do believe that the remedy really will be in the advance of education—education which shall instruct the people in the true principles and necessities of political economy. Surely we have had most serious warnings. Look at the present state of business. Look especially at the state of the coal and iron trades. Look at the condition of South Wales. With these things before us these gentlemen must surely see that there must be something paradoxical in their position, though I quite believe that they are honestly sincere, yet they may nevertheless in some cases be misled. It is a very grave but very interesting fact that although there has been an effort made the other day in America, where the Democratic Cabinet used their power with an intensity and severity which Government cannot assume in this country, that outbreak of a socialistic character was put down by the common sense of the people, although at a considerable sacrifice. With regard to the building trade, surely it is one in which the difficulty of this question must press upon you as strongly as possible. What was said by one gentleman in regard to the additional employment of machinery and the use of composite material with the concrete is of deep import to working men. These new things are being adopted every day, and I am certain within a few years, if this agitation does go on, you will find an entire change in the construction of the building trade of this country which will throw out of work a large portion of the skilled labour that now could find employment.

Professor KERR, Fellow.—I gather from the speeches of Mr. Howell and Mr. Potter, as representatives of the working classes, that they are willing to appeal to the body of Architects as impartial and intelligent enough to be invited to give their verdict upon the broad question now at issue. I will not take upon myself to speak for the body of Architects or for the mass of the men in this room; but I have to suggest three propositions. I think architects at large, who, I may say, are most impartial judges on this question and most anxious that justice should be done on both sides, would be in the first place perfectly prepared to countenance and encourage trades' unions for all good purposes, because we ourselves know how good a purpose it serves for our own profession to be bound together in unity. But there are two things no architect will ever countenance as regards the policy of trades' unions as a matter of fact. The first is the attempt, whatever form it may assume, to equalise wages. That is a thing no architect would ever think to be either just or judicious. Secondly, he would not countenance the monstrously cumbrous, awkward and wicked policy of strikes. There never can be an excuse for a strike in this world. On that, I believe, we would all agree. I am sorry these gentlemen should be in a minority, but I am afraid that is inevitable in the Institute of Architects. A strike is an act of open war, internecine war, war *à outrance;* and the object with which it is initiated is to destroy most effectually for the occasion the whole ground work of peace policy. Now if there is anything which has benefited this country during recent times it is the peace in which we have been fortunately allowed to exist; and if there is anything which will benefit the

working classes it is the pursuit of an undeviating policy of perfect peace. Common sense exists in this country almost in excess; at all events we may certainly say that common sense may probably always be relied upon; and the common sense of the public is against those who fight. I have ventured to suggest—and the common sense of architects may be taken as representing the common sense of the public—that we shall never agree either to an equalisation of the wages of workmen, or to the policy of strikes.

Mr. CHATFEILD CLARKE, Fellow.—I do not quite sympathise with the tone of our friend who has just sat down. I think it would be a great mistake if any representatives of working men left this room without feeling that architects are able not only to a certain extent to understand the position they occupy but to appreciate it. Of course in common with many of the other speakers I cannot shut my eyes to the fact, as an architect, that there has been a decadence in the kind of work and in the quantity of work that one sees on one's buildings. With regard to the question of labour, I hold that the working man, as a free agent, has a perfect right to combine with his fellow men to raise his wages to any extent where no intimidation is exercised upon the individual man himself. I put that as a sort of limitation upon the bent and genius of Professor Kerr's argument. Further than this (though I rejoice to believe that arbitration is the true ground for masters and men to meet upon in any question of difference of wage) I still believe and maintain that supposing the masters will not meet the men or the men the masters, a strike or a lock-out may become a necessity. Therefore I do not go so far as to say that a strike is a crime. However much we regret the injurious character and operation of strikes we cannot say that they are in any sense a crime, but rather they are the unfortunate result of the antagonism between labour and capital where neither party have met the thing in quite the right spirit. Don't think that I believe the effect of strikes has been good: I believe they have been most prejudicial, but on the other hand I think we ought to show the widest and deepest sympathy with the working men in their efforts to raise their position in the social scale, and we ought to try and place ourselves in their position and recollect what that position is, and that monetarily they have nothing to live by except by increasing their wage to the greatest extent.

Mr. ARTHUR CATES, Fellow.—I am able to offer a very apt illustration of the manner in which the working man endeavours to elevate the standard of his position, to increase the amount of his earnings, and to better his condition: an enterprising contractor in the west country, having large demand for worked granite, and desiring to introduce that admirable material extensively in the works on which he was engaged, had to some extent been supplied from certain quarries where for perhaps sixty years the masons had worked piece-work. With a view to developing this trade he became the occupier of the quarries and made arrangements for embarking a considerable capital in the works, premising that the labour would be carried on as heretofore, but no sooner had this capitalist desired to take labour into partnership with him, and to ensure the development of the profitable employment of labour and of capital, than the local society gave him notice that no more piece-work should be done, but all day work was insisted on *at one rate of wages*. And this is a fair illustration of the course the working man thinks most adapted to advance his interests. [Mr. HOWELL.—Was that notice given by a union?] I apprehend by the Society of Granite Masons. [Mr. HOWELL.—We cannot test facts of this description without the name.] My correspondent does not specify the name of the society, but the quarries referred to are the Dartmoor Granite Quarries. The notice was received from a society. The result of this action taken by the masons or the society on their behalf, has been that my informant has been compelled to abandon the intention he had formed of developing the working of these quarries, and where perhaps 300 men might have had full and continuous employment paid for in such a manner that each man's skill and

physical power would have received its commensurate reward, without limit imposed on the extent of earnings, and a corresponding benefit would have been conferred on the whole locality—only some thirty men are now engaged in the preparation of pitching, the commonest form of labour, and this because under the system insisted on by the men, the cost of production of work such as curbs ashlar-plinths, moulded work, &c., like finished work, would cost some 25 or 30 per cent. more than under the old system. The same correspondent writes that for the execution of certain limestone welling, he, as on previous occasions, invited the masons to take it piece-work, but they objected, saying the society would not allow it, but only day work. Further, when he attempted to measure what a man had done to ascertain if he was earning his pay, this was not allowed, and if persisted in a strike would ensue. I contribute these facts for the consideration of Messrs. Howell and Potter, facts which unfortunately for the well-being and prosperity of the working man are rather the rule than the exception.

Mr. TROLLOPE, Visitor.—I have known this trade for forty years. I think the whole question was raised at once by the first statement of Mr. Howell, who when speaking for the men said that the object of every man was to get the most he could and to do the least he could. That has been the point between the union and the employers of labour for the last twenty years. Allusion has been made to the strike of 1859, and our's was the firm struck against. I will tell the Meeting how that was brought about. We had some masons at work; my brother saw one man continually doing next to nothing as he thought, and he said to the foreman :—"That man is always idling—discharge him." The foreman said, "I can't; he is a shop steward, and if I discharge him the whole of the men will leave." My brother said, "I can't stand this, I will have his work measured, and if he has not earned his wages he shall go." The work that he had done in a week was found to be worth 15s. 6d., and he was getting about 35s. The man was discharged, and on the Monday the whole of the masons left, and so began the strike of 1859. That principle has gone on more or less ever since. I can tell the Meeting a recent instance. A friend of mine, a contractor, was employed on a Gothic work, and a certain number of Gothic heads had to be done, and £5 was allowed in the quantities for the performance of this work. The one was done as a model for the architect to see and put up in its place, and the architect approved it. The man had executed it fairly for £5 or under. When the others were put in hand it was found they came to £8 each. The man said, "I musn't say much about it, but the shop steward won't allow us to do them for £5. He says they are worth £8, and we must make them come to £8." How is it possible for a master builder to estimate work under those circumstances? All competition contracts of that sort during the last few years have been a mere toss up. It is impossible to calculate the cost of labour. I am quite sure of this that the men might earn more money if they were only true and honest. There need then be no disputes. I agree with everything Mr. Lucas has said. If we could get a profit of 10 per cent. upon labour we should be perfectly satisfied, but instead of that it has been too frequently a 10 per cent. loss as far as labour is concerned. The thing has come to such a pass that whether we introduce German labour or not, matters can't go on in the way they have been going for the past few years. Workmen must get out of their heads the principle of "getting the most wages they can strike for, and then doing the least work they can." I am sorry, but not surprised, to find this principle plainly stated by Mr. Howell.

Mr. CHRISTIAN, Fellow.—I am very glad to learn from Mr. Howell and Mr. Potter that it is conceded by trades' unions that men are now to be paid for their work according to its value. I see no objection to a minimum wage, but let the men who earn more be paid as much as they can get. I should like to state a fact that happened in my own experience thirty-eight years ago, when I was superintending the building of a church as Clerk of the Works. A few years before I had been

advised by a shrewd Scotch builder that if ever I had the opportunity of superintending work in that capacity I should not fail to value everything that was done as it went on. I did so, and I have taught many young men, much to their own advantage, to do the same since. During the progress of the works it so happened that there were twelve masons working under one shed, and in one particular week they each had to work exactly the same thing, a plain moulded capital. Of these twelve men, the first did his work better and quicker than any other man, finishing it in three days. The second man was quite four days, another four and a-half, others five or more, and the worst six, and that man (because he was a setter) was paid 5s. 6d., all the other men 5s. It struck me at the time as most unjust that this first man who did his work so well and so quickly should be paid no more than the slower men, when he ought, according to value, to have been paid double as much as the last. Is it possible for architects to approve of such a system as that? It is hardly necessary in this room to repudiate the notion of Mr. Howell that it is the nature of all men to wish to do the least possible amount of work for the greatest amount of pay. I don't believe that it is the wish of any man whatsoever *who is worth his salt* to act on such a principle, and I am quite sure that if he did act upon it he would deservedly suffer.

Mr. LASCELLES, Visitor.—As a small employer of labour may I be allowed to give you my experience as it somewhat differs from that of Mr. Lucas and Mr. Trollope. I do not pretend to have carried on works that can compare in magnitude to theirs. My work has been on a smaller scale. I have always found the men to be most industrious, and have never had the experience of a strike. I believe that my men do quite as much work as they did twenty years ago. I am not speaking of bricklayers—my experience being confined almost exclusively to joiners. I have always found the men most desirous to do all they could for the welfare of the business and assist me in every possible way. It would not be right for me to sit and hear so much against the men, when I have found them my best friends and when I cannot speak too highly in their praise. One remark has been made as regards the rate of wages. I think we are labouring under a misapprehension on that score. I fancy the sum fixed by the trades' union is the minimum amount, and the men may earn more if they can, and sometimes do. I am told every man to be a member of the union shall be a man capable of earning a certain amount of wages in order that it may be some gauge as to his ability. They fix a minimum rate of wages, and I think if a man can earn more they are only too glad for him to do so. As regards piece-work, mine is a piece-work shop, and it is known to be such. There have been men connected with trades' unions who have worked for me, and very good men indeed they are. One of the best men in my employ is such a man, and at a meeting of the Trades' unions in the Park some ten or twelve years ago I know he was on the Committee. He is a very industrious man and has studied my interests for many years, and I should never wish to have a better man in my employ.

A FELLOW.—Would the last speaker say whether the great bulk of his men are not non-union men?

Mr. LASCELLES.—It is possible they may be; I have never inquired. I know I have at least one union man, and there may be a hundred. My shop has gone on for forty years and has never been closed a day. We have never had any dispute.

Mr. LUCAS.—I repeat that whatever I receive for labour I will give to the men less 10 per cent. We do not profess to carry out works at less than 10 per cent. profit, and I do not believe any man can do so. What that gentleman (Mr. Lascelles) stated as his experience of the joiners, I can also state, but I spoke of out-door works, and there is not done that quantity which ought to be.

Mr. HENFREY, Visitor, said:—As a contractor for the last thirty-five years, he had heard with some amazement two statements: one from Mr. Howell to the effect that brick-work could not well

be carried out by piece-work; the other from Mr. Lucas, that the labour on the brick-work at the York Station had cost £5 per rod, equal to about 9s. per cube yard, in consequence of the trades' union compelling him to employ day-men only. He remembered building a railway viaduct in Manchester about the year 1844. The labour of the brick-work was all let piece-work at prices varying from 1s. 10d. per cube yard for foundations to 3s. per cube yard for 14-inch parapets. From the statements made, bricklayers' wages have risen about 50 per cent. since 1844, and this should make parapets, or similar expensive work, worth 4s. 6d. per cube yard at the present time. To this we must add other 4s. 6d. for the indolence, or want of skill, of the York bricklayers, to arrive at the cost of 9s. per cube yard, which Mr. Lucas had to pay in consequence of the interference of the trades' union.

The CHAIRMAN in closing the Discussion, said,—We have arrived at that point at which, if it is the desire of the Meeting, we can adjourn to our next gathering, a fortnight hence; but if you feel that there is no reason for discussing the question further, it will be now necessary to conclude the present proceedings. I would only say a very few words. I have been very much pleased to see the good temper with which this Discussion has been carried on, and my only regret is that we have not had more representatives of the masons and the working classes present than we have had. Unfortunately, I called upon one of them at the very outset and put him in this way a little at a disadvantage, for which I have to apologise to him. I think that Mr. Brassey put before us very clearly the statement of the case—more clearly, indeed, than we have had it dealt with by anybody this evening. He pointed out very fairly that the increased cost of living, and of everything that the working-man has to provide, justified a considerable advance of wages. The question as he put it, appears to me to resolve itself into one simply of supply and demand. He has pointed out what has not been commented on to-night, and what is of the greatest importance, that the common labourer, who is not benefitted by any trades' society, has increased his wages during the period to the extent of about 64 per cent., while the skilled mechanic has only increased his by 50 per cent. Speaking for architects, but with the most kindly feeling for working-men, I must say that the result of my experience is certainly very much to confirm what is said by Mr. Lucas and others on that side—that we do not get at the present day the same amount of work that we used to get, and that the quality has not a tendency to improve, and that in spite of the statements which Mr. Howell and Mr. Potter make that they only fix the minimum amount that any man may earn, as a mere matter of fact, fixing a minimum rate must almost always fix a uniform and maximum rate also. The result is that we see for instance such a class as the masons, with whom I personally am most concerned, who work upon Gothic architecture—and it requires a very skilled mason to make a good Gothic workman—compelled to work, and it is monstrous that it should be so, at the same wages as the man who does an altogether inferior sort of work. Certainly on these terms nobody will rise from a dead level. The workmen's object should be just what the object of the architect is, to encourage the good workman and to let the rest see before them the example he sets, and the much higher position in which he stands, by reason of his ability and the superior quality, and perhaps quantity too, of the work he does. How do you suppose men rise in other professions? By doing, not as little as they can, but as much as they can in hours far longer than those of the workman, and therefore, if it is the result of the action of trade societies that men are limited in the amount of work they are allowed to do, they are condemned, not by a hostile critic, but in my case, by one who is very anxious to see the working-man get his rights, and who is most emphatically opposed to the notion of there being any "wickedness"—though too often much want of prudence—in strikes. I see no wickedness in a strike, so long as it is to obtain a fair day's pay for a fair day's

work. The wickedness is when it prevents the best workman from earning the best wages, and in spite of any denial one does often find particular workmen objected to because they do too much work. I have myself known such cases as that quoted by Mr. Cates, and of which he gave us the particulars. They are not imaginary cases. An architect who goes about the country as I do meets with these difficulties in all directions, and knows that they do occur; and without knowing what all the rules are, and what all the exact decisions of the societies may be on the subject, that is one of the practical results of their action. The statement that they only insist upon a minimum amount of wages is, at the same time met, unless I am very much mistaken, by the fact that, if a builder proposed to give two rates of wages, nearly all the men who work for him would probably absent themselves forthwith. My own experience is certainly of that kind. The societies undoubtedly interfere more or less with the freedom of the workman. The Discussion we have had to-night, if it does nothing else, will show the representatives of the working classes how little hostility there is to them or to their true interest, and I must say that I think the speech of Mr. Lucas was creditable to him in every way. I trust that the outcome of all this will be that workmen will consider, if, at the present moment, they are defeated in the attempt they have made to raise their wages beyond a certain point, still that the masters have their interests necessarily just as much as their own in view, for what they have to consider is, whether in granting an increase of wages they won't be ruining the business that keeps them both? What Mr. Lucas has said about the replacement of brick-work by concrete is quite true. The tendency of the rules which the societies are making is to destroy all art. If we dare to have nothing but concrete done by labourers at the lowest wages, and if stone-masonry and good brick-work are to become things of the past, I think that good architecture will also entirely disappear from the field, and that we as architects shall have to give up our work! Therefore, in the interests of my profession, and in the interests of the workmen, I appeal to the representatives of the working-men to-night to reconsider their position; and I do hope that sooner or later these rules of the societies (which are so mysterious that when they are quoted on the one side they are always denied on the other), shall be so far modified as to encourage, first of all, good work and honest work, and that it shall not be possible for anybody long to say, as it has been said this evening, and in a way that most of us, from our experience, could confirm—that, as a rule, men do not feel it their duty to do the greatest amount of work in the best way and in the shortest time.

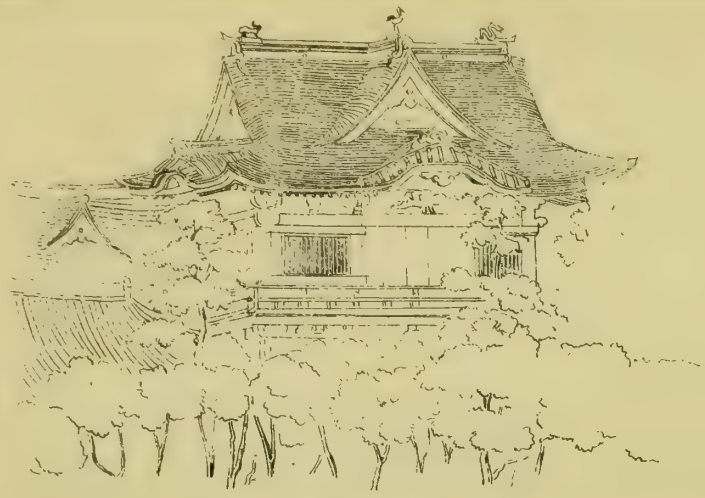
The Discussion on Mr. Brassey's Paper having thus been brought to a close, the Meeting adjourned.

ERRATA IN SESSIONAL PAPER No. 7.

The following mistakes occur in the report of Mr. G. E. Street's remarks during the Discussion on Mr. I'Anson's Paper, "The Architecture of Norway." and should be corrected as follows:—

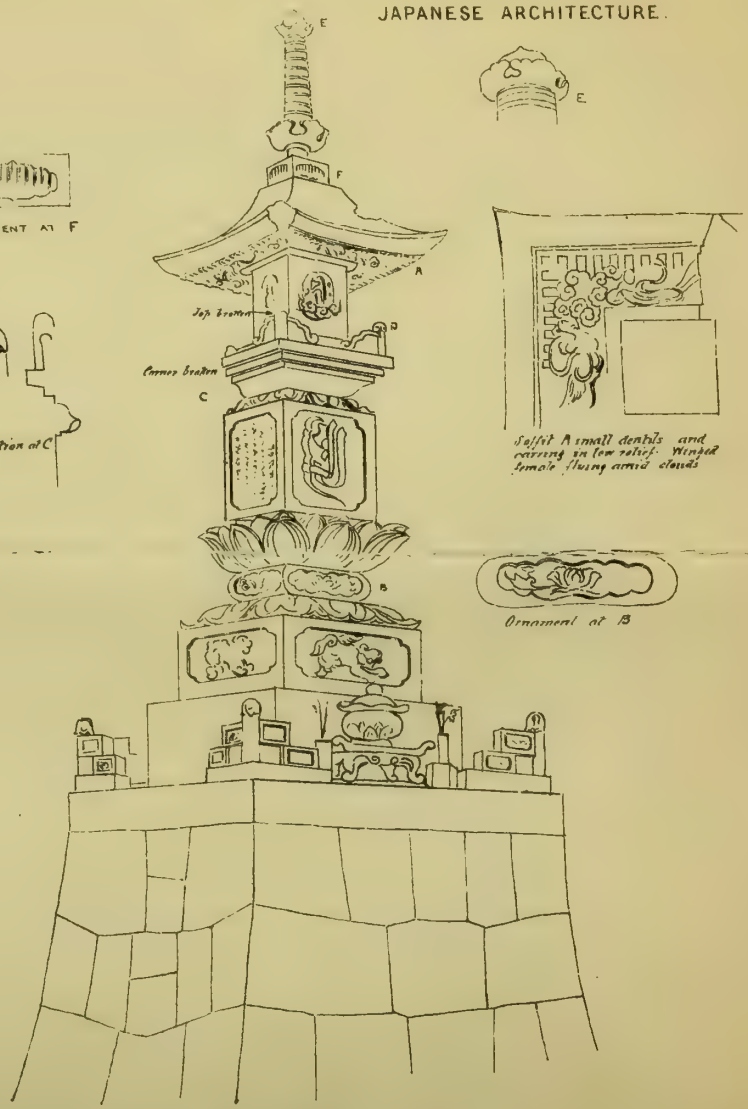
p. 141, line 15, for	"Angeirne"	*read* "Angevine."
„ 43, for	"conventional"	*read* "conventual."
142, line 11, for	"Church,"	*read* "Chevet."
„ 22, for	"banded,"	*read* "bonded."
143, line 12, for	"lob,"	*read* "cob."
144, line 33, for	"piers,"	*read* "spires."

JAPANESE ARCHITECTURE.



TEMPLE OF KAMEIDO: NEAR YEDDO.

ORNAMENT AT F



Soffit A small details and carving in low relief. Winged female flying amid clouds

Ornament at B

BUDDHIST TOMB: SHIBA TEMPLE: TOKIO.

TEMPLE AT UYENO: TOKIO.

JOSIAH CONDER, DELT

Photo-Lithog^d for the R.I.B.A. by C.F. Kell 8 Castle St Holborn E.C.

Royal Institute of British Architects.

At an Ordinary Meeting of the Institute, held on Monday, the 4th March, 1878, CHARLES BARRY, President, in the Chair, the following Paper was read :—

NOTES ON JAPANESE ARCHITECTURE.

By JOSIAH CONDER, Soane Medallist for 1876, and Professor of Architecture at the Imperial College of Engineering, Tokio, Japan.

IN venturing to connect some sketches made by me in Japan with a short Paper upon Japanese Architecture, I feel in no small measure how imperfect is the knowledge that I have as yet been able to accumulate on the subject. As, however, it is one upon which not very much has been written especially from a professional point of view, I beg permission to lay before you my scanty notes, hoping for a future opportunity of enlarging upon them after longer and closer observation and more extended travel in the country. The most noteworthy buildings being those devoted to religious purposes, adapted to the ritual of a most complex mixture of faiths, combined with the deification of deceased historical heroes, it is a matter of no small difficulty and research to form a clear analysis of the meaning of their arrangements and peculiarities. There is much to be done at some future time in comparing the forms of Buddhist Architecture here with that of India and China. The introduction of Buddhism into Japan from Corea dates 552 A.D., but it remains to be seen how far the religious architecture is a pure imitation, and how far it is a modification of that of China :—how far it has been simply copied, and how far grafted on to an original style, or afterwards modified by the inventions of native artists or by religious reformers.

Japanese Architecture, until the employment of foreigners within the last few years, has been, with very few exceptions, entirely of wooden construction. In certain parts of the country, where stone lies to hand in boulders or is otherwise naturally exposed, there are a few instances of its use in the construction of the walls of small houses and simple temples. There is a small temple near Nikko, about fourteen feet square, of which the walls are built of oblong blocks of stone placed upon their narrow ends, forming the whole thickness of the wall, without bond, and having all the external joints covered with a large plaster roll to keep out wet. The roof is also formed of large slabs of stone hollowed out on the surface and cemented at the joints in imitation of tiles. In addition to this there are to be seen several stone bridges—large stone walls surrounding the principal cities, solid stone monuments to the dead, imposing flights of stone steps with stone railings leading up to the temples, lamps of stone and bronze adorning the temple precincts, and bronze statues of gigantic size ; stone is also invariably found employed in the pavement of courts, and as a substructure to wooden buildings in order to form a stable and dry foundation. On account of the constant fires which occur in the large cities, particularly during the winter, there are not many of the ordinary street dwellings which have not been repaired or rebuilt within quite recent times. The temples, protected by their isolation and in many cases by thick groves, as well as many important dwellings set apart by themselves can boast considerable antiquity, but the ordinary domestic and street architecture is of comparatively modern erection. Some of these larger dwellings of the nobles have fallen a prey to treachery and wanton destruction: others have been burnt to the ground through the introduction of European heating appliances into wooden walls without precautions and protection. The Tokio Foreign Office, one of the finest old Japanese buildings in the capital, which was entirely destroyed this year by fire, is said to have been set on fire from a stove pipe running through a wooden wall without any protection whatever. It appears, nevertheless, from such

representations as can be found in books, that the arrangements and general appearance of the ordinary houses have not altered since very early times. They are fragile wooden structures, never more than two stories in height. The walls are constructed of a vertical and horizontal framework of posts and beams morticed together, filled in with bamboo laths, laid crossing, bound together, coated with mud in several layers, and finally plastered over. Sometimes the beams and posts shew, being flush with or projecting beyond the plastered surface, and sometimes the whole is plastered over, framework and all. This latter method is employed in larger buildings, and in the "Kuras" or Godouns. A Kura is often many months in building: the mud, which is taken from the bed of some river, being spread over the framework in a great number of layers, and each layer being allowed a long time to harden. The projecting timbers at the eaves are also thickly coated with the same clayey mud, and to the small window openings are hinged shutters coated to a very great thickness with the same material. The whole surface of the building is then plastered over and finally covered with a coating of lacquer. These Kuras often remain standing after street fires, but they are by no means thoroughly fireproof, for the mud often cracks and falls off with great heat, and even under ordinary circumstances they require constant renovation and repair.

In the ordinary houses one external wall or more, and most of the internal walls, are not covered with plaster, but are open between the uprights, being filled in merely with light wooden screens sliding past one another in grooves formed in the heads and cills of the framework, so that the whole partition can be thrown open at any part. Where light is required, these screens are formed of thin wooden framework, divided into rectangles of some simple design, and filled in with tough translucent paper, or in some cases in interiors they are covered with paper, decorated with patterns or paintings. Each room opens into the neighbouring rooms, and passages are seldom to be found, except in the largest of houses. Sometimes, however, the greater portion of a room will be raised about 12 inches above the level of the entrance, leaving an L shaped space or passage on two sides. The raised portion is covered with mats and used by the indwellers as the room proper. In small rooms the whole floor is on one level and covered with mats. These mats are always manufactured of one dimension (namely, 2 ft. 11 in. by 5 ft. 10 in., being twice as long as their width), and a room is invariably built, measured, and described, not according to its actual dimensions, but by its number of mats. They are made of rushes neatly woven upon a light wooden frame, are about an inch and a half thick, soft, slightly yielding and warm. The houses of the highest and the lowest, as well as all temples, have their floors covered with these mats a little differing in quality. There is generally in one wall of a room a small recess formed in the framework, in which are placed one or two rows of shelves, moulded, polished, and lacquered. These shelves are generally arranged in some quaint unsymmetrical manner, and form an ornament to the room themselves, while they serve for the display of vases or small ornaments. Even the lowest classes of the Japanese shew great taste in judiciously disposing small treasures of good shape and colour to the adornment of their dwellings. They convert the smallest strip of land into a miniature garden, which they plant with well trained shrubs and flowers.

The simple habits of the Japanese, both as regards resting and feeding, render but little furniture necessary for the complete comfort of the householder. Small low tables, more like what we call trays, are used for serving up food—one being set before each guest. A metal lined box, or sometimes an ornamental bronze receptacle, is used for the small charcoal fire from which warmth is obtained in cold weather. A room is invariably provided with one or more folding screens which, as the inmates sit or recline on the mats, do not require to be of any great height in order to secure privacy, and keep off draughts in cold weather. Small chests of drawers are to be

found in private rooms for clothes, &c., and these, as well as the hibachis, tables and screens are mostly of some elegant shape and pleasing design. If a house be of two storeys, the upper storey is reached by wooden steps, leading up from room to room, and composed of two strings with treads and no risers, somewhat inconvenient in their slope and generally without handrails. The ceilings of the rooms are wooden, consisting of the underside of the floor boards of the room above, crossed by the small joists supporting them, and sometimes by smaller ribs between, dividing the surface into squares; the whole is polished or lacquered. Probably, in early times, houses of this class were covered with thatched roofs, projecting considerably at the eaves, or were covered with boarding and wood shingle. In country parts there are now many roofs covered in such ways, but most of the houses in the cities have heavy tile roofs of great projection, with large ridge and hip tiles and terra cotta ornaments at the extremities. The roofs are often slightly concave on their surface, resembling those found on a larger scale in the temples, from which they are undoubtedly copied.

The Shintoo Temples, which are built in imitation of the earlier temples of that religion, prior to the introduction of Buddhism, have roofs of two plane sloping surfaces, very salient at the ends and at the eaves; and it seems from this that the heavy curved and hipped roof, which now abounds so in Japan, was an introduction from Corea or China and came with the religion of Buddha. The tiles are always of a greyish black colour, and the joints are covered with a thick roll of white cement. One peculiarity is the great size of the ridge and hip ornaments, which are constructed of several courses of tiles and cement, forming quite a little wall along the ridge and hips, terminated by large terra cotta ornaments at the extremities. These ornaments are most of them very artistic in shape.

In houses of two storeys the upper storey is sometimes set back a little, the projecting portion below being covered by a small lean-to roof. There is often below this another flat roof projecting some three feet from the lower wall to keep off the sun and to protect the frail wooden entrances from wet. This roof is generally in part suspended from the roof above, and partly supported at wide intervals by light bamboo posts. Small gutters of bamboo are generally fixed to these lower eaves, with pipes of bamboo to carry off the water. In the hot season "sudaris" (a kind of cane blind which admits air, permits outlook, and at the same time gives shadow from the sun) are hung from the eaves to the ground. The above description applies both to the dwellings of the lower and the middle classes, the latter being somewhat larger, more cleanly, and better furnished.

The tea houses or hotels are on a much larger scale and vary in their arrangements. They are very often planned on three sides of a little entrance court laid out as a garden—a verandah with a floor some twelve inches from the ground running round these sides and serving as a passage from one room to another. The upper storey also has generally a verandah covered with a salient roof, under the eaves of which paper lanterns are hung at night. In large hotels (called Yadoyas) there is generally a small interior court, in one corner of which cooking is conducted in the open air, the rest being laid out in some ornamental manner, with ponds, streams, shrubs and stone lanterns. Round this is an interior verandah, and often miniature wooden bridges enabling one to cross the court without dirtying the feet.

The dwellings of the higher classes, which are called "Yashiki" or "Miya," are considerably larger and more architectural. Their arrangement is very simple, being a group of somewhat low rooms, opening one into the other, having a lobby or hall at the entrance, and sometimes one passage from front to back. They are not more than two storeys in height, and are covered with a heavy tile roof of wide span, with terra cotta ridge and hip ornaments, and prominent eaves supported

by a rich cornice of beams and brackets, and having elaborate carving displayed in the gable ends. Over the entrance to the house there is a wide portico, supported upon strong posts which are often moulded on the edges. The lintels, beams and projecting rafters are also moulded on the edge, and carved with some flowing line of ornament, deeply incised upon the flat surface. Such ornament is very effective, being delicately and sharply cut, and can be seen from a great distance. The portico roof is either a continuation of the curved line of the large roof or consists of a smaller roof intersecting this. In the latter case a favourite form is that of a double ogee, convex at the ridge and concave at the eaves, forming a gable or semi-gable at the front. By this is meant, that on the front the curve of the roof is continued half way, and is then, as it were, cut off, showing the sides of the end rafters projecting, decorated with bronze clasps and adorned with carved and pierced wooden pendants. In the large roofs the semi-gable is also a favourite form for the ends; in this case the upper portion being of the gable form and the lower portion a sloping hipped roof. What I have called bronze clasps or belts correspond to what, if placed at the end of a beam, would be called shoes, being gilt and engraved plates of metal placed in the centre of exposed beams and lintels, serving for no purpose but ornament. They are much used in Japanese architecture. The windows are generally greater in length than in height, being low oblong openings filled in on the outside with thick wooden bars, arranged sometimes vertically and sometimes horizontally, the whole being open to the air. On the inside of these windows there are always sliding shutters or paper windows to keep out wet or cold in bad weather.

The Japanese seem greatly to seek privacy for their houses, even when they are placed in country districts they are mostly fenced in. They sometimes have an open loggia to the upper floor as in the hotels, from which they can enjoy the surrounding view; but the approach to the house is invariably shut in, and the lower storey hidden by high railings of bamboo. In houses of one storey this fence often reaches as high as the eaves of the roof. The Yashikis are shut in in a similar manner, perhaps with a view to protection from treachery as well as to the love of privacy. Not only are the whole grounds surrounded by a high wall on three sides, with a long range of buildings and strong gateway on the entrance side, but there is often a high wall or fence close up to the front of the house, through which the open portico projects. Between this and the outer gateway, with its range of buildings, there is a paved court, on the two sides of which servants' quarters, stables and other outbuildings are erected. From the street the outer gate and its surrounding buildings present in many cases a very pleasing façade. The long horizontal lines of ridge and eaves, as well as the horizontal effect obtained by the lower storey being constructed differently from the upper, is relieved by the vertical window bars, and projecting bay windows on each side of the large recessed wooden gateway. The gateway itself is of very solid and strong appearance; thick posts, carrying heavy wooden lintels, which support the upper storey over the gateway form the framework of the heavy doors. The posts, lintels and doors are lavishly shoed, belted and adorned with plates of engraved and gilt bronze. There is in some of these low mass of buildings, marking the approach to a Daimo's dwelling, a simple grandeur of line of proportion and balance of parts, reminding one as much of the repose and beauty of Greek architecture, as the Japanese decorative ornament in many of its forms, and in the beauty of its execution, reminds one of Grecian art. The walls are generally placed upon a base formed of two or three courses of stone. The lower storey, instead of being plastered upon the outside, is sometimes covered with large tiles placed square or diagonally. They do not overlap, but are fixed to the laths, side by side, the joint being protected by a large roll of cement. The tiles being dark grey and the cement white, this treatment presents a somewhat curious bold chequered appearance. Placed

symmetrically on either side of the gate are often two square projections, about 9 feet by 6 feet, of one storey, with an ornamental curved roof and carved gable. They correspond to our bay windows, and command a side view of the gate, for porters or a guard who occupy these rooms. These projections have also a stone base, and are framed about four feet from the ground, with window bars and transomes placed very close together. They are protected when necessary by sliding shutters from within. Such windows sometimes occur at the ends or the centre of the range of buildings on either side of the gateway. The other windows are either oblong openings, with thick wooden bars, or else small projecting windows, framed out some few feet above the ground, and supported on carved or moulded wooden brackets at each end. This framework is sometimes perfectly open at the bottom, the whole front and sides being filled with close bars, and the top covered by a small curved lean-to roof. The inside is protected by sliding shutters flush with the inside of the wall of the room. In some Yashikis in Yedo these projecting window openings are continuous, running nearly the whole length of the building, with brackets at intervals. The whole of the exposed woodwork (gate-posts, lintels and windows) is often lacquered in black or a dull red colour.

The smaller and inferior Yashikis are often of one storey only, and instead of being plastered or tiled, are frequently boarded with planks nailed on to the wooden framework slightly overlapping at the lower edge to carry off wet. The whole is stained a dull black colour. The outer walls, referred to as being placed round dwellings of this class, are either fences made of strong wooden posts and beams covered with planking and protected by a little tile roof supported upon brackets at the top; or they are of considerable thickness constructed in alternate layers of tiles and cement, the cement being as thick in its layers as the tiles. The top is protected from wet and decay by a little projecting tile roof with ridge tiles and ornaments similar to the roofs of small buildings. There are no instances of the walls of dwellings themselves being constructed in this way with tiles and cement. At the back of the dwelling within the surrounding walls are large grounds, generally laid out very prettily as a landscape garden. These Japanese gardens abound in grassy mounds and terraces, planted with an endless variety of trees and shrubs fantastically trained, with groups of large stone slabs and boulders, running streams, small lakes, fancy bridges and stone lanterns.

The palaces of the Emperors appear to have been a collection of a number of detached buildings of the class just described, surrounded by a wall of great circuit with a number of entrance gateways. A Japanese book, which refers slightly to the subject of architecture, says:—"Jimmu Tenno, the first Emperor of the present dynasty in Japan, lived in Kashiwara no Miya, in Yamato, which was the first building of the kind called Miya in Japan. It is related in a book that, seven years after the ascent to the throne of Suiko Tenno, Siyotoku Tyshi proposed to build a Miya of a fixed size and arrangement, as the former Miyas were of different sizes. This was to be 365 ho. square (730 yards square) and to consist of 28 good detached limoki buildings (name of wood) with the bark of the tree used for the roofs. Of these buildings the twenty-fifth was to be for worship and the rest for the affairs of government. One large building must have been in the same style as Hinosho-Ku (in China) having ornamental pillars and ceilings. O. Haruta no Miya was built according to this rule and arrangement. In the twelfth year of Yenriyaku a new Miya was built by Kuwan-Jun Tenno, in Yamashiro, and in the tenth month of the following year he removed from the south to the new Miya, the latter place being the present Kioto." The name given to these large Miyas seems to have been Dairi or Dai Nairi, meaning Imperial residence, as the writer goes on to say, "The complete plan of this Dai Nairi measured 36 cho. (4320 yards) from north to south, and 20 cho. (2400 yards) from west to east. It had the same arrangement as the Palace of Kanya-ku, in China,

having twelve gates in its circuit. About 160 years after this Dai Nairi was built, it was burnt down and since that it has been rebuilt several times. After the Shoguns came into power a small Dairi was built instead of it."

From a very rough print accompanying this description, supposed to represent the plan of the palace, each building being shown with four lines, it appears that the dwellings were arranged in a somewhat uniform manner, so that the whole group occupied a rectangular space. The buildings were separated by a number of wide walks crossing at right angles and leading to the numerous gateways in the boundary wall. The principal gates seem to be on the small sides, or what may be called the ends of the group, and on the centre or axis the principal buildings stand. On entering the centre gate at one end, there is an open court and then other gateways before reaching the first large collection of buildings. These buildings forming a distinct group are called the main offices, and will be referred to later on as they are distinct by themselves and are explained by another diagram.

To the right and left of these main offices, and of the court preceding them, are a number of detached buildings separated by wide walks. Those on the right comprise an Assembly for Ministers, one for religious powers, a department devoted to music, large buildings for provisions, cooking and stores. On the left the buildings are some of them larger and the walks consequently fewer. They comprise a large hall for banquets, the house of the chief musician, several houses of which no explanation is given, and two long buildings on the outside used as stables for the horses of the Emperor and his body guard. Beyond the main offices, in the centre of the group, there is an open space which was probably laid out as garden grounds. Set back in this open space and a little to the right is the Emperor's dwelling or Dairi, and to the right and left are dwellings for the Princes Royal. Behind the Dairi are separate buildings for provisions, money and clothes. Still further to the right and left, on the outside of the group, are two long buildings occupied by the Emperor's body guard. At the back of the Dairi, forming the end of the group, are two large buildings, each called the financial department; and the buildings on either side consist of the house of the Kuge, or ancient nobility attached to the Court, a small temple, secretary's house, house of the night watch, Kura for weapons of war, and Kura for lacquered goods.

The Palace proper, or Dairi, is surrounded like Miyas by low buildings with gateways. The front gateway leads to a garden, on the right and left of which are two trees said to be of great antiquity, being planted by the earliest Emperors of Japan. Across this garden is the main building, which is rectangular, having two wings at the ends extending forward on either side of this garden or court. A portico projecting out from the main building leads by steps to the reception hall, where a particular spot is described as the Emperor's seat; and positions further to the left for two Ministers of War.

The two side wings contain officers' rooms, reading rooms, sitting rooms, business rooms and rooms for the chief servants. In the main building behind the hall are situated the private rooms of the Emperor and a picture gallery; also a room devoted to the Emperor's "barber," who seems to have been honoured with a position next to the Emperor's own apartment. In addition to this there are rooms for clothes, brushes and sundries. At the right and left of the reception hall are other sitting rooms, a bath room and rooms for jewels and treasures. The whole of the back portion is surrounded by a verandah looking on to another enclosure or garden. The large group mentioned above as the main offices, comprises reception rooms for eight Ministers of Government. It appears that these buildings were only used on special occasions when the Ministers met in Council or were received by the Emperor. They consist of fourteen large detached buildings

arranged symmetrically in an oblong plan with an open space in the centre, the whole enclosed on the outside by a wall or fence with gates. One of these buildings seems to have been for special use when the Emperor was present, as it is called the Emperor's room, and it is approached on the side nearest the Dairi. The other buildings, nearly all of the same size, are each for the united assembly of the Ministers it seems. The whole of the palace buildings and offices taken together covered an immense space, there being in addition to the main offices and the Dairi forty-eight large buildings, the circuit of the whole group being a rectangle of 7,200 feet by 10,800 feet. Upon the executive duties of government being assumed by the Shoguns, the Emperor's Palace become a much smaller and more compact collection of buildings.

The Military Architecture of Japan seems not to have been much more substantial than the rest, though many cities contain large moats and the stone walls within which the castle buildings stood. The central portion of the city of Tokio is surrounded several times spirally by a deeply-cut moat with large grassy slopes. Towards the centre, this spiral forms a complete enclosure, and on the inside of the inner moat is a thick stone wall constructed of large polygonal blocks, which originally carried wooden defensive constructions surrounding the castle within. The larger number of these wooden constructions were pulled down some years ago, but those few that remain form, with the solid walls, deep moats and strong gateways, an extremely picturesque feature of the city. Comparing these remains with a rough plan of a castle taken from a Japanese book, it appears that there were in the centre enclosure of these fortresses three principal buildings of a tower-like form. The most important and the highest of the three, called Homaru, was immediately under the chief in command, and for the use of him and his retainers. The second, which was somewhat lower, called Ninomaru, was devoted to the use of the second in command; and the third, lower still, to the third in command. This last was called "Sannonaru." These buildings were of two, three or four storeys, placed upon a solid battering stone basement similar in construction to the surrounding walls. Each storey is set a little back within the lower, the projecting portion below being covered with a very salient roof adorned in some instances by little excrescent roofs presenting richly carved gables. The top roof, which is generally hipped, is slightly concave and has a very bold projection. The towers are often oblong in plan, and then the ridge of the roof ends in a small gable terminating in a hipped roof. These crowning roofs also carry little dormer gables, apparently neither used for light or ventilation but as ornament; they are generally little roofs of a curved form. In addition to these dormers the ridge and hip tiles are richly adorned with finials at the extremities, the ridge often terminating in a large representation of a dragon or fish with the tail curled upwards, executed in copper. The walls are thicker than those of ordinary houses, and are constructed of wood filled in with mud and plastered over, showing only the wooden window-frames, which are occupied by thick wooden bars set closely together.

Close to these three central towers is a cemetery for the dead, with a little temple enclosed. There are also within the castle wall six or more large Yashikis, being the dwellings of the chief Samurai, or officers of importance, and their retainers. In addition, are a large mound commanding an outlook and several small Shintoo Temples, the principal one being dedicated to Haceman, the god of war. The outside wall, constructed in large polygonal blocks of stone and backed with earth, is interrupted at intervals by large gateway constructions. The ponderous wooden gates are hung to heavy square posts with thick lintols above. These gate posts, some 18 inches square, often in pairs, are shoed and belted with bronze plates, mostly gilt and engraved. The gates too are generally adorned with metal fittings. The approach is by a permanent wooden bridge erected over the moat. Upon the surrounding wall, built out for the purpose so as to flank those who enter the

gateways, are erected towers similar to the interior keeps, though somewhat smaller; and also at all angles of the wall are two storied towers. Between these buildings and the gateways a low building or shed covers the whole top of the wall, taking the place of the hoarding to our mediæval battlements.

The Temples of Japan are by far the most interesting and instructive buildings to be found in the country; set in the solemn shady quiet of their thick groves, approached by their avenues of lamps both stone and bronze; with the grand sweeping lines of the roofs projecting boldly forward, upheld by a profusion of brackets. They abound in wooden carving tastily disposed, sharply and beautifully cut, and the whole is often decorated in well harmonized colours with gilding and bronze ornaments. The principal temples are to be found in Nikko, Osaka, Kioto and Tokio (or Yedo). The two principal groups of temples in Yedo are at Uyeno and at Shiba, and at both these places the large central temple has been destroyed by fire. The subsidiary temples, however, are so numerous and imposing that these sites still rank first in importance in the city as temple groups. But the Uyeno and Shiba temples may be said to have belonged to the late Shoguns. It was under their direction that they were built and that the vast sum required for their erection was provided. Here were erected their shrines and the oratories attached to them, which are now the most splendid and attractive buildings to be seen, loaded with the richest profusion of decorative art. The shrines of the 1st and 3rd Shogun, both eminently illustrious in Japanese history, are at Nikko. Those of the 2nd, 6th, 7th, 9th, 12th and 14th at Shiba, in Yedo, and the others at Uyeno.

The temples at Shiba are enclosed on three sides by a long wall with several gateways at intervals, and backed by a thick wood of fine old trees. The streets surrounding the walled sides consist of a continuous avenue of pine trees, interrupted only by one large and two small gateways forming the approach to the sacred grounds. The principal entrance is a large and imposing wooden structure some seventy feet wide and of about the same height. It is built upon heavy wooden pillars arranged so as to form one principal opening and two side ones, these wooden posts being tied together by horizontal beams tennoned to the posts, the sides of the entrances being filled in between this framework with panels of wood. Half way up, above the soffit of the entrance, which is formed of heavy beams, a tiled roof, slightly concave, projects forward and exhibits the ends and underside of numbers of rafters supported upon corbelled brackets. Above this roof the upper storey is set a little back and is surrounded by an open balustrade; this upper storey is constructed of wide posts and horizontal beams with wooden filling in, crowned with a cornice of wooden corbels assisting to support the double rafters of the roof. This roof has the heavy appearance, the concave contour, and the semigabled form at the ends which are peculiar to all Buddhist temples in the country. After looking at other religious buildings where every part is painted, carved, or gilt, this gateway might be considered somewhat plain, as it has no carving, and is coloured with one uniform dull red colour; but it has more claim to grandeur of proportion and general effect than any other building which I have yet seen in Japan; its great size, good proportion, picturesque roof with ornamental crestings, also its numberless corbels, brackets and rafters, some moulded at the ends so as to suggest the frowning face of a monster; and its deep red colour, bright where the sun strikes, and subdued in parts by the tree shadows and the sharp deep shades of its cornices and roofs,—all these help to fill the beholder with the liveliest feelings of satisfaction. Passing through this portal we find ourselves in a large open space some 200 feet square, in the centre of which stood the large temple, now burnt to the ground. Across this space, nearly opposite to the great gateway, is a little temple approached by steps leading to a paved ante-court containing a few tombs and an image of Daibutz in bronze. This ante-court is defended towards the entrance by a screen and low gateway. The most noteworthy

buildings, however, are on the right hand side of the open space just referred to. These buildings consist of the shrines of the 2nd, 6th, 12th, and 14th Shoguns and those of their wives, with the religious buildings attached. They were originally approached by two other gates, at some distance to the side of the great gateway, which belongs to the large temple now destroyed; but these small gateways are now closed. They are very similar, and it will be sufficient to describe one. The entrance forms the centre of three compartments divided by wooden pillars and connecting beams; the two side compartments form recesses for large wooden figures considerably larger than life and indicative of exaggerated muscular strength and extreme hideousness. The face of one is painted bright red and the other a livid green; the posts, wooden panels and gates are carved and coloured in red, black and gold with diapers in colour in some parts. The name given to the gate is Nio Mon (Mon-gate), Nio being the name of the hideous janitor who is supposed to guard the entrance to Buddhist sanctities, and whose representation is placed in carving on each side of these gateways. Within the Nio Mon an open space or court is passed, containing several rows of stone lamps, being large stone lanterns placed upon circular pillars with heavy bases moulded and carved, in all about five or six feet high. These were gifts from the smaller Daimios, being offerings to the Shoguns' shrines. Before some shrines there are long avenues of them, increasing in importance as they approach the temple. This court is enclosed by an ornamental screen fence, in which another richly decorated gateway with heavy folding doors leads to another court surrounded on three sides by a wooden screen wall carved and painted and protected by a tile roof.

Here are situated the large and elegant bronze lamps which were the dedication offerings of the great Daimios, and placed in the same court to right and left are two structures which are found in some form or other before all Buddhist temples of importance. The first or right-hand building consists of a large battering basement slightly concave and built in this case of stone in large courses, upon which is erected a wooden room of one storey with a large roof, richly carved and coloured roof rafters, brackets, posts and panels; also an elegant balustrade carried upon projecting corbelled brackets. The ends of the rafters and the corbels of the wooden cornice are carved in the form of dragons and various beasts; and from the corners of the roof little bronze bells and pendant ornaments are suspended by chains. This is called the bell tower and contains a large bronze bell, which was struck formerly in time of war. At the bottom of this battering stone base is one of the few examples of stone carving actually forming part of a building that I have seen, consisting of panels carved with conventional flowers and foliage.

Facing this belfry, upon the opposite side of the court, is a large granite basin, about 3 feet 6 inches by 8 feet, diminishing towards the base, where it is ornamented by means of a trefoil cusp form, cut out of the centre of each side. It has also on one side two exquisitely cast bronze dragons of small size fixed into the stone, and serving as water-spouts. This basin is covered by a highly ornamental shed, consisting of a picturesque tile roof with gilt enrichments, supported upon angle posts sloping inwards towards the top, where they are tied by cross beams supporting brackets and carving just below the eaves. This shed is a beautiful example of Japanese decorative art. The posts are slightly moulded on the edges, and chiselled on the surface in a simple diaper of lines, the whole coloured red. The cross beams which tenon into the posts apparently interpenetrate, their ends reappearing in a moulded form on the other side. They are decorated with a diaper of geometrical design composed of light colours, as are also the groups of brackets above, with the addition of much red and gold. The oversailing rafters of the roof are also richly coloured in a similar way, and shoed at the ends with bronze gilt and engraved. The ceiling within is divided by ribs into square panels carved with flowers in relief, and coloured with great delicacy and careful imitation of nature. At

the further end of this court, where the largest and most ornate bronze lamps are placed, is a long roofed wooden building upon a stone basement, with a gateway in the centre. This is the entrance of the cloister preceding the Haiden, as the temple we are approaching is called. The long building is quite open on the inside, being a wooden cloister, or gallery, running parallel to the Haiden, from the centre of which another cloister, open on both sides, runs at right angles to the entrance of the Temple. Towards the outside court this cloister presents a range of posts, connected by horizontal beams, filled in with wooden mouldings and carved panels. Above is a wooden cornice, with brackets and projecting roof. The whole being raised above the preceding court presents a stone basement some three feet high, in the centre of which are steps leading to the entrance. The gateway is lower than the roofed cloister, but very imposing. The gate itself is placed between large posts flush with the side walls, but other posts are built out and connected with horizontal beams, so as to form the sides of a porch and support the overhanging roof. These sides are filled in some distance from the ground with thick panels of wood carved in the form of a writhing dragon of wonderful execution, cut right through so as to be viewed from either side. The wooden posts or columns of this porch are curved inwards towards the bottom and shoed with engraved bronze, placed upon a flat moulded stone base, somewhat similar to that of an Egyptian column. They are reeded, and curve in slightly towards the top, where they are also fitted with an ornamental metal socket. These pillars are connected by horizontal beams, apparently inter-penetrating their surface, their moulded ends reappearing. The whole is crowned by the ordinary rich bracketed cornice and forest of rafters, and the ornamental tile roof which in this case is of double curve.

The gateway and whole range of buildings are beautifully coloured, viz. :—with bands and small masses of light colour and gilding upon a deep red ground. The posts, beams, and plain woodwork between the panels are red with gilt bronze shoes, sockets and belts. A little black is introduced in the form of framework within the main framework of the posts and beams, giving a sort of border to the red panels. In the centre of the spaces thus formed is the raised moulded border, of curvilinear form, containing a panel of carving coloured in whites, light blues, greens, purples, and other cool delicate tints. The beams and brackets of the cornice, and the under sides of the rafters, are decorated in light coloured diapers, not unlike the mediæval European diapers found in roofs, ceilings, &c. Gilding is lavishly employed, blended with the colours, in the diapers, and ornamenting the edges and mouldings of the beams and panels.

On the inside, towards the Temple, the open cloisters are composed of richly carved coloured and gilt posts and beams, with a cornice and heavy roof. The centre cloister leading up to the steps of the Haiden increases in height, its roof sloping upwards when the steps are reached until it intersects the principal roof.

This building is preceded by an open portico, and round the whole of the outside, on a level with the floor, runs an open gallery. It is intended for the worship of the souls of the 6th, 12th and 14th Shoguns, and consists of two oblong rooms, with a passage uniting them : the first room is the largest, and is called the Lower Haiden (Shimo Haiden) ; the broad passage connecting this with the Upper Haiden (Kami Haiden), is called the Ainoma, or Interval Room ; at the further end of it are four or five steps approaching the Upper Haiden, which is on a higher level. The Kami Haiden, also called the Houden, is very small, and kept gloomy. Along its opposite side are ranged three large gilt shrines, in imitation of small temples, bearing in the centre the name of the Shogun to whom they are sacred. These are raised upon a sort of table, or altar, arranged along the whole side, and between them are gilt images ; before them are placed little tables supporting offerings, the tables being very elegantly carved, lacquered and gilt.

The whole interior is low, but this is not always the case in Japanese temples, there being many instances of great interior height, though the entrances are indeed generally low. The floor is the only part which is not ornamented in some way, being covered with the ordinary rush mats; in this case, however, slightly wider than those used in houses. The steps between the rooms are of polished, or sometimes of lacquered wood. The entrance is closed with heavy double doors, carved and gilt. The interior walls, where not interrupted by sliding doors and windows at the sides, exhibit the same framework of posts and beams, filled in with panels, and crowned with a cornice supporting the ceiling. The first rows of panels—those next the floor—are filled in with paintings upon a gold ground, representing in some cases large growing flowers and plants, and in other cases hideous imaginary animals. Above these the panels are carved in imitation of flowers and birds, such flowers as the lotus and botan (peony) being great favourites; the whole beautifully coloured. The posts, slightly projecting beyond the panels, support corbels of wooden brackets forming a cornice, with intermediate brackets and paintings between. The framework is coloured red and black, with many metal fittings.

The windows, which admit some light, are small openings of many curved outline, filled in with an open arabesque of wood or metal gilt, placed towards the outside, there being sliding shutters or paper windows on the inside to cover them if needs be. The ceiling is divided into small squares by ribs, lacquered black, with bronze sockets at the joints: these squares are painted and gilt in representation of dragons. All the painting is done with the most exquisite care and skill. On the outside there are carved panels of birds, plants and flowers ranged in a line under the coloured bracket, cornice and rafters. The outside is coloured red, relieved by the gold, bronze, and the light colours of the diapers and carving.

The roof is a fine example of the ordinary temple roof. It is composed of tiles, covered with thin plates of bronze, which have now assumed a dull grey of a slightly greenish tint. The tiles are alternately flat and semi-cylindrical, and the rolls thus formed along the roof are very effective, added to an ornamental ridge, and richly modelled and gilt terminals. The projecting edges of the tiles at the eaves are gilt, and the cylindrical tiles are stamped with the Shogun's crest. The semi-gables which occur at the ends are filled in with carving and pierced wooden pendants, all coloured in red or black, as the other parts of the building. This Haiden is said to have been completed as recently as twenty years ago—about ten years before the revolution and the overthrow of feudalism in the country.

In addition to this Haiden, dedicated to the three Shoguns interred in the vicinity, we find, further situated to the right, three small Haidens, scarcely less elaborate, dedicated to each Shogun individually, erected at his death, and placed in front of the court preceding his tomb. These three courts behind the smaller Haidens are backed by a high retaining wall, faced with masonry set back, above which are the shrines. They are reached severally by a large flight of stone steps, projecting into the court below. The first reached is the shrine of the 6th Shogun, erected 170 years ago. It is entirely of bronze, and is by far the most handsome of the three. It is some ten feet high, composed of a circular drum with an enriched base upon a stone basement. It is rounded towards the top, and covered with a curved projecting roof formed of bronze, with little chains and bells attached at the corners. Upon the drum is the name of the Shogun sharply cast in the metal, as are also delicate mouldings and foliage, executed with great skill.

The whole is enclosed by a low, thick, bronze railing, with little solid bronze gates diapered on the surface with the favourite key pattern. The tomb is set back; and, in a line with the front of the wall, at the top of the steps, is a little gateway, with roof and double gates, all of bronze. The

heavy gates are diapered with very shallow but sharp ornament; and the side wings, or walls, also of bronze, are ornamented with casts of two peacocks in low sharp relief. All the ornament is much more severe, more sparingly used, and the parts much heavier in proportion than the other tombs and their gateways, which are of stone and wood, and of later date.

The tombs of the 12th and 14th Shoguns are of stone, similar in general design to the last named, and the gateways are of wood, richly carved and coloured. A short distance from these temples are the shrines of the wives of some of the Shoguns. The tombs themselves are but little inferior to those of the Shoguns, but the courts and Haidens preceding them are much smaller, and their position is secluded and not reached by steps.

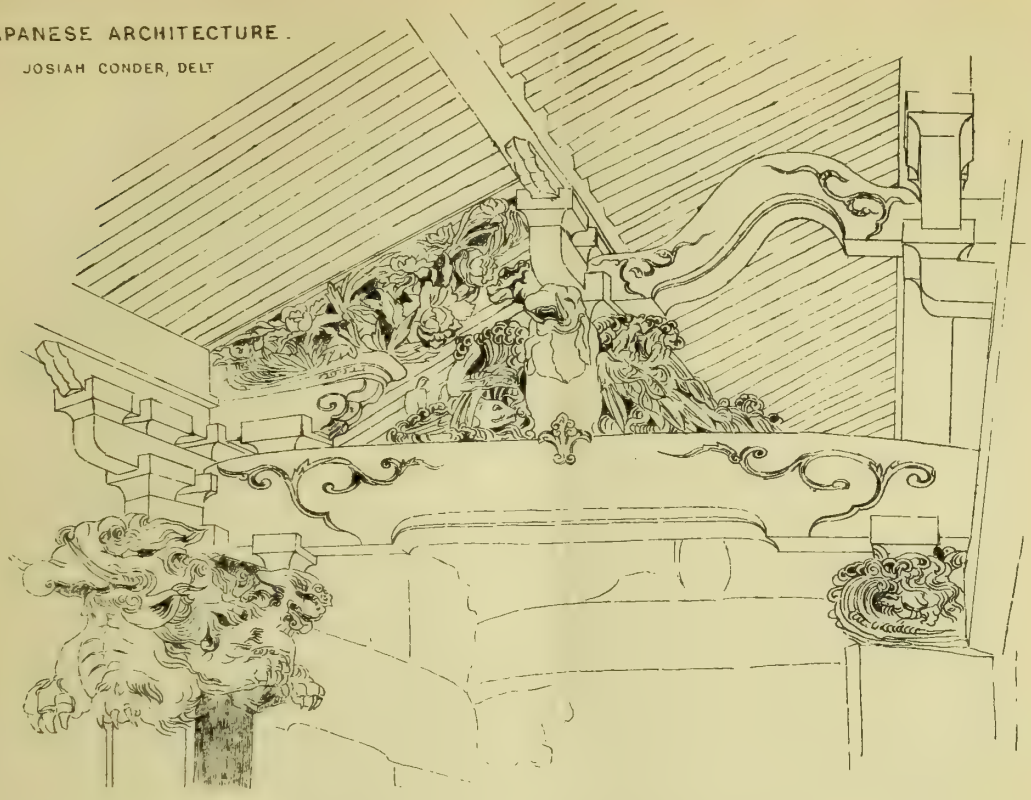
At Uyeno, in the north of the city, there are the Haidens and shrines of the 4th, 5th, 8th, 10th, 11th and 13th Shoguns, being grouped in threes, having one haiden to each three, viz., the 8th, 5th and 13th, and the 4th, 10th and 11th. The arrangement is exactly similar to that of Shiba, but the stone and bronze lanterns are more numerous; and the forms of the roofs, and details of carving and mode of colouring are rather different. Black is much used in the decoration of these buildings at Uyeno. The outer gates are entirely black, with gilt and bronze ornaments, having the peculiarity of a roof covered with small wood shingle instead of tiles. Black is also much used in the decoration of the Haidens, which are otherwise richly coloured, as at Shiba. The shrines of the 4th and 5th Shoguns are of bronze, with their railings, gates and bas reliefs; the bronze has a dull greenish colour, approaching to black. Though the arrangements and general mode of construction of these sacred buildings are so similar that to describe each involves much repetition, yet there is such a variety of details—such different treatment in points of decoration, both carving and colouring—that there is in them an endless study for the artist.

The carving is generally cut in camphor wood, and the colour is mixed with a kind of size which seems effectually to resist the action of the weather. The posts, beams and all large surfaces decorated in one colour, are coloured with the medium of lacquer; which is either left of a dead colour, or is polished to a great degree of brightness. The bronze shoes and other ornaments are deeply engraved and filled in with black in the hollows. The Japanese sculptors divide carving into three kinds—Shallow, Deep, and Pierced. In the earlier work, such as the bronze tombs and gates of the earlier Shoguns, the relief is very shallow,—at the same time very sharp and effective. In the later work, nearly all carving upon the outside—such as in screens, gateways, and cloisters—is pierced in parts, being cut in a thick slab of wood, and can be viewed from either side. A striking quality of sculpture of this kind is the extremely careful imitation of nature, leaves and flowers being carved with a delicacy and truth to nature that is marvellous, and coloured with the same care and beauty. Fruit is gilt, with red dashes of colour showing the ripeness: and the greens in colouring the foliage are varied in their tone. Fore-shortening is frequent and well rendered; and though the Japanese artist does not seem to have understood the principles of perspective, which are often violated when dealing with representations of buildings and rectilinear forms, the perspective of all natural forms is carefully noticed and imitated. In Japanese theatre scenery I have also seen interiors of buildings represented correctly in perspective.

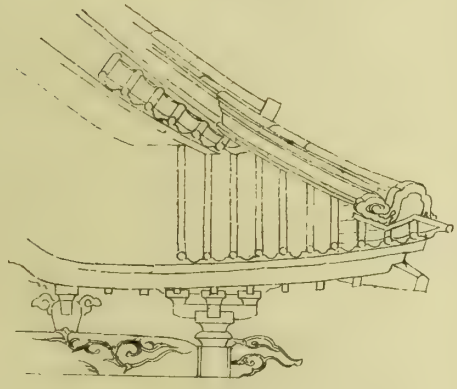
The third kind of carving—the deep carving—occurs mostly in the interior of buildings when depth of effect is required, but at the same time no communication with the outer air which would be obtained if pierced carving were used. Beams and posts are often diapered with shallow incised carving, the key pattern being a very favourite one, sometimes with the stem and leaves of a plant intertwining. Posts are round, round and reeded, square, or square with the corner slightly rounded or moulded. They are rounded inwards and shoed with bronze, both top and bottom, and often possess a

JAPANESE ARCHITECTURE.

JOSIAH CONDER, DELT



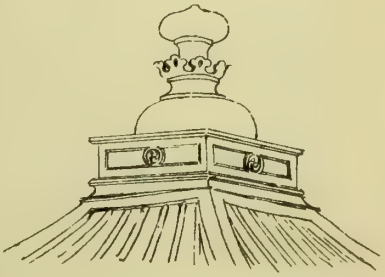
HONWANJI TEMPLE · ASAKUSA : NEAR TOKIO



CORNER OF ROOF OF A TEMPLE

TOP OF A BRONZE LAMP

STONEWORK AT BASE OF WOODEN TEMPLE BUILDING



FINIAL TO A TEMPLE ROOF : TOKIO.

Photo-Lithog^d for the R.I.B.A. by C.F. Kell 8 Castle St. Holborn E.C.

flat bell-shaped capital (similar somewhat to the Egyptian capital called "bell-shaped" by Mr. Fergusson, but flatter still), often resting on a stone base of similar form at the bottom. The projections of inter-penetrating beams are curled upwards and moulded, or are carved in the form of the fore parts of lions, elephants or some other animals real or imaginary.

In addition to the shrine temples at Uyeno there is a temple for public worship, called the temple of Gougen, of considerable size, though far inferior to the large temple burnt down during the revolution. It is approached under a Torii along a long paved path, with rude stone lanterns and large trees on either side: this leads to the raised stone platform, or court, which precedes the temple. It is approached by steps and protected by a wooden fence and gateway. This wooden fence is framed with posts and rails, dividing it into three rows of panels horizontally. The centre range is filled in with lattice work of an ornamental character, and the upper and lower ones with carving partly pierced, well coloured, and protected by a little tile roof carried upon a cornice of brackets. The gateway is rather higher than the fence, being covered with an elegant roof of double curve. In this inner court there are elegant bronze lamps; the largest and most ornamental being placed on either side of the steps leading up to the temple door. The temple is nearly square in form, with a small projection at the back containing a sacred shrine. The whole is carved and coloured both on the interior and the exterior, the constant use of black and red being noticeable, and the carving being mostly in light colours.

The temples at Shiba and Uyeno may be called Buddhist; but there are signs of Shintoo religion to be found in each. The architecture of the Shintoo sect was much simpler than the Buddhist architecture, not only because the pure forms of Shintoo religion were much earlier than the introduction of Buddhism, but also owing to the simplicity of a faith which objected to images and to extensive ornamentation. Since the year 774 A.D., however, Buddhism, Shintooism, and Confucianism have been blended in such a way—the forms peculiar to one religion being found in temples professedly of another—that those who wish to find a meaning and a reason for certain forms and arrangements are sorely puzzled. There are a great many Shintoo temples in the country; the principal one, at Yedo, being the Kudanzaka. The temple grounds are open, and not surrounded by a grove, as are the principal Buddhist temples: they are entered under a structure found before all Shintoo temples, called a Torii. It is composed of two upright posts of great thickness, generally consisting of the whole trunk of a tree rounded, about 15 feet high, and placed twelve feet apart. Across the top of these a wooden lintol is placed, projecting considerably, and curving upwards at the ends. Some few feet below this another horizontal piece is tennoned into the uprights, having a little post in its centre helping to support the upper lintol. These Torii were originally of wood, as is the one at Kudanzaka: but when found before Buddhist temples, which is not unusual, they are mostly of stone; always showing, however, by their joints and general construction a decidedly wooden origin.

The temple itself is of simple oblong plan, with steps leading up to the entrance and to an exterior gallery running all round. The roof differs from the roofs of Buddhist temples in being flat and not curved on its sloping surfaces, which are rather steep, and project considerably at the eaves, and at the gabled ends. The roof is covered with wood shingle, stained of a dark grey colour. At the gable ends there are cross timbers in the shape of the letter X. Astride on the roof also at intervals, along the heavy ridge, and apparently balanced across it, are curious beams some 6 feet long, tapering towards the ends. The whole appearance is extremely heavy and curious, and the peculiar forms, such as the cross pieces and beams crossing the ridge, seem to indicate an affinity to the original thatched roof. In some parts of the country, the Shintoo temples, are still covered

with thatch. The construction of the walls of the temple is in the main similar to that of the Buddhist temples, but the wood is uncoloured, and sparingly decorated with carving. The projecting rafters and ends of beams are generally carved. Colour as an exterior ornamentation is by no means found in all temples, even of Buddhist religion.

There is a temple at Asakusa in Yedo, which is called Honwanji, and which is, I believe, the largest building in the city; but though remarkable for its great size and height, and for the quantity and exquisite workmanship of its carvings, it is entirely devoid of colour on the exterior, and the wood has assumed an ashen grey hue. It is almost square, and is surrounded by a gallery reached by steps and roofed over, the posts supporting the roof being shoed with bronze, and the beam ends carved into monsters, lions or elephants. The gallery floor is supported upon brackets, which spring from the base of the walls of the temple very near to the ground. Numerous beam ends, rafter ends, brackets and supports, are carved into the most delicate representations of flowers, plants and birds, in sharply cut carving. The roof of the temple rises to a great height. The interior is decorated in colour; and, on account of the great span of the roof, there is a peristyle of columns assisting to support it, upon which are groups of corbelled brackets blending with the design of the panelled ceiling. These brackets correspond to similar ones placed round the walls in the cornice over pilasters. The ordinary panels of coloured carving are to be seen below.

Yedo and its immediate neighbourhood contains some twenty-seven temples of importance, besides many other smaller ones as numerous as London's parish churches. To describe properly and fully one temple group would require a Paper to itself. To be able to analyse and classify these temples would require an acquaintance with the various sects (whose name is legion) and research among books written in the Chinese character. Many forms are to be found most closely resembling the Buddhist Architecture of India. The Torii for example is strikingly similar to the Indian Toran, though much simpler. It is worth notice that the tiger and elephant (never seen in the country) are extensively used in carving.

There are in the country of Japan several gigantic bronze images of Buddha, in addition to other smaller ones. There is a small one at Shiba, supported upon a stone battering platform. It is a seated figure, with the hands laid palms upwards in the lap. The drapery is well arranged, and the features well modelled, having an expression of calm dignity and benevolence. The Daibutz (Great Buddha) of Kamakura is of enormous size and imposing appearance. The expression of the features is a work of consummate art, and the proportion is good, though the head is somewhat large. There is a Daibutz of large size at Uyeno, which is not to be compared with either of the two last named. It is distorted and expressionless, and approaches the ludicrous. The same difference is to be found in some of the stone tombs on which figures are carved, and which are to be seen at intervals by the road sides in the country. Although many are clumsy and shapeless, others are executed with great art.

At the conclusion of the Paper, which was read by Mr. T. Roger Smith, Fellow, the President asked Narinori Okoshi, an Attaché of the Japanese Legation, who had been invited to attend, whether he had any remarks to make on the subject, but that gentleman said that he begged to be excused from attempting a speech in a foreign language, but he could not withold his testimony to the accuracy of Mr. Conder's descriptions; and the Meeting then adjourned until Monday, the 1st of April, when this Paper will be discussed.

Royal Institute of British Architects.

THE DEATH OF SIR G. GILBERT SCOTT, R.A., PAST-PRESIDENT.

At a Special General Meeting of Members only,* held on Monday evening, April 1st, 1878, for the purpose of considering what steps should be taken to do honour to the memory of Sir G. Gilbert Scott, R.A., Past-President; CHARLES BARRY, F.S.A., President, in the Chair.

THE PRESIDENT rose and said,—Gentlemen, this is a Special Meeting, and one of no ordinary kind. There are no minutes to read, and I will address to you a few words on the subject of our Meeting to-night. I do not think I need apologize for putting off the Ordinary Meeting and making this a Special one under the circumstance which has so unexpectedly and suddenly befallen us. The information of the decease of our distinguished and dear friend, Sir Gilbert, reached me early on Thursday morning, he having died the previous day, and I at once ventured to take the responsibility upon myself at the suggestion of our old friend Professor Donaldson—and having had the opportunity of consulting several of my colleagues on the Council—to put off the Ordinary Meeting, and summon you here specially to-night. The Council at large have condoned my action in this respect, and I am quite sure you will do so too.

The subject we have to discuss to-night is how we may, in the short space of time which intervenes between this and the end of the week, take such steps as the Institute I am sure will desire to show its appreciation of the great loss it has sustained. We are not met to-night, as I find the hurried wording of the circular may have led some to suppose, with the idea of taking any public measure with reference to any solid memorial of our departed friend. That would be a little premature at this time, though I have no doubt the subject has occurred to the minds of several; but we are met to confer together with regard to the sad preparations for his funeral. Sir Gilbert's remains are to be interred in Westminster Abbey on Saturday at 12 o'olock, and the Council have appointed a small committee to take the necessary measures, in order that the Institute (assuming it will be the earnest individual and collective desire of the Members to do so) may be properly represented at that funeral.

The first step which I took in the matter was to write of course to Mr. George Gilbert Scott, the eldest son of our friend, and I ventured to express condolence in your name as well as my own, and also to suggest that the Institute would very earnestly desire that his burial might take place in the Abbey, with which he has been officially connected for so many years, and which therefore seemed the fitting resting place for so eminent a man. I will read to you the reply of Mr. Scott to that letter; and at the same time (inasmuch as I was not then officially authorised to

* By order of the Council, a few gentlemen (not members of the Institute) who were colleagues or pupils of the late Sir Gilbert, were invited to take part in the proceedings.

do so) I wrote a private letter to the Dean of Westminster expressing the same hope, and asking him to favour me with his views, so that I might place them before you to-night. I will read to you the answer that I received to that letter. We have therefore met to-night to consider this matter, and there are two ways in which it ought, I think, to be looked at. One action which we shall naturally desire to render, will be to show our personal appreciation of Sir Gilbert Scott and his high professional position, and our deep sense of the great loss we have sustained; and the other will be to take into consideration how we may join in the ceremony at the Abbey in our corporate capacity. I ought, perhaps, to have prefaced what I am saying by reading the letters I have referred to, but I am not sure whether it is not better to tell you all that took place and then read the letters, which will illustrate the cause and effect of what has been done. It is suggested that at the funeral the Institute should be corporately represented in such official way, through your President and Council, as may be consistent with the necessary arrangements made by the family. A circular will go out as soon as it can be printed, inviting every member of the Institute who feels a desire to do so to be present at the Abbey. Of course the first portion of the service will take place in the choir, where no doubt only a limited number can be admitted: but the Abbey itself is large enough to contain all the numerous friends of Sir Gilbert, and I am quite sure the Institute will form no small part of that assembly.

I will now read the letters which will illustrate what I have said to you. My letter to Mr. Scott, of which I have not a copy, was dated the 29th March, in reply to his letter, dated March 28th, announcing his father's death, and which is in these terms :—

Courtfield House, Collingham Road, S.W.
March 28th, 1878.

My dear Sir,

It is my painful duty to inform you of the death of my father, Sir Gilbert Scott, which occurred early this morning. My father had been slightly unwell for the last few days, but there had been nothing to cause any anticipation of danger.

I am, my dear Sir,
Yours very faithfully,
G. Gilbert Scott, Jun.

To the President of the Royal Institute of British Architects.

To that I replied in the terms I have explained; and in the afternoon of the same day Mr. Scott wrote me as follows :—

Courtfield House, Collingham Road, S.W.
March 28th, 1878.

My dear Sir,

The Dean of Westminster has written to me, proposing that my dear father's remains should be interred in the Abbey. He says that he usually prefers to wait for some sort of requisition "from some distinguished men in the department of life to which the deceased belonged," but that my father's special relation to the Abbey has induced him in this case to act upon his own responsibility. He will therefore be particularly gratified to receive from the Royal Institute the assurance that the step he has taken is in accordance with the wishes of the Institute and the profession. I need not say how gratifying the proposal which your

letter indicates is to all our family. My dear father would have appreciated nothing so much as this recognition of his worth by the members of the profession he loved so well. I have written to the Dean, mentioning the purport of your letter.

I am, my dear Sir,
Yours very faithfully,
G. GILBERT SCOTT.

To CHARLES BARRY, Esq.
President of the Royal Institute of British Architects.

And in the same afternoon I received the Dean's answer to my letter. My letter runs in these terms:—

1, *Westminster Chambers*, 28 *March*, 1878.

Dear Mr. Dean,

I am sure you will pardon my writing, as President of the Royal Institute of British Architects, to tell you that a very wide-spread hope is entertained by its members, with whom I need hardly say I fully sympathise, that our departed illustrious friend, Sir Gilbert Scott, should find his last resting-place in the Abbey he loved so well.

I have summoned a meeting of the members of the Institute for Monday afternoon, and I should be very grateful to you for a few lines on the subject to shew them.

I have the honour to be,
Yours very faithfully,
CHARLES BARRY.

The Very Reverend
The DEAN OF WESTMINSTER.

The Dean replied as follows:—

March 28*th*, 1878.

My dear Sir,

I fully concur in the purport of your note. On these occasions I endeavour to make it a rule not to take the initiative, but to wait till I receive a request from the distinguished members of the department to which the deceased belonged. In this case, owing to my absence from Town, and also considering the long official connection of Sir Gilbert Scott with the Abbey, I intend to break through my rule and I have made the offer at once to the family, who have gratefully accepted it. I should still, however, much prefer that the members of the Institute should present me a request (signed by any other distinguished person that occurs to you) which should be my public warrant for the interment, which on personal grounds I am ready to sanction. Being very desirous of paying the last tribute of respect to our departed friend, I have asked the family to defer the funeral, if possible, till Saturday the 6th, when I trust that my medical advisers will allow me to be present, as well as to preach on the 7th.

Yours very faithfully,
A. P. STANLEY.

CHARLES BARRY, Esq.

The sermon which Dean Stanley is likely to preach, will, I am sure, be attended by many members of the Institute. Then I received a letter from our friend Mr. Clarke, identified as he is with the Architectural Museum, who states this:—

13, *Stratford Place, Oxford Street, W.*
29*th March*, 1878.

My dear Mr. President,

I am quite sure the Council of the Institute will pay all the honour and respect they can to the memory of our much loved Past-President, so suddenly and so sadly taken from us all; but as his son writes to me: He was taken in the fulness of his reputation, in the perfect power of his mind, quietly and with probably no suffering whatever, and in the midst of his works he loved so well. For him such a termination to so honourable a life is better far than lingering illness, and perhaps failure of powers. He has died in harness. Amen!

I am taking steps to have the Royal Architectural Museum represented at his funeral. However this may be, and I trust and feel certain the Institute will, officially in its immediate connection with ourselves, and the great Architectural school he represented, do all it should. I am sorry from circumstances I cannot attend the Council Meeting on Monday, but may I, Sir, ask you kindly to bring this communication forward out of the ordinary routine.

We may now indeed be thankful we have Richmond's portrait of Sir Gilbert over your chair. I am sure you will forgive me in uttering the strong personal feelings I have for our late revered ex-President.

Believe me, dear Mr. President,
Yours very truly,
J. CLARKE.

The President of the Royal Institute of British Architects.

I may mention that Sir Gilbert was President of the Architectural Museum in which our friend Mr. Beresford-Hope is much interested, and he will probably have a word to say on the subject. Then I have a letter from Lord John Manners, who writes:—

Her Majesty's Postmaster-General,
April 1*st*, 1878.

Sir,

I regret that I shall not be able to attend the Meeting this evening, at which it will be proposed to mark the sense entertained by the Royal Institute of the loss Architecture has sustained by the lamented death of Sir George Gilbert Scott.

I request to be associated in any steps which may be agreed to be taken to do honour to his illustrious memory.

I have the honour to be, Sir,
Your obedient servant,
JOHN MANNERS.

To CHARLES BARRY, Esq.

Our Past-President, Mr. T. H. Wyatt, writes from Ireland to say he has received the circular, and regrets greatly being unable to take part in the melancholy business of this evening, but he desires to co-operate in any way to do honour to Sir Gilbert Scott's memory. Mr. Benjamin Ferrey, Vice-President, has been lately a great invalid, and his son writes to express his great regret that for that reason, and that only, he is unable to be with us to-night; and I have just received a letter

from Mr. Scott, as I came into the room, intimating that Saturday at noon has been fixed for the interment of his father in Westminster Abbey—the procession to assemble in the Chapter House at half-past 11, the interment being, as I have said, at noon.

These, gentlemen, are the communications with respect to the arrangements for the funeral; and I may tell you that the Council have left the carrying of them out in the hands of the two Secretaries and myself, inasmuch as they felt that a small executive committee was the best way to deal with an emergency like the present, so that we may put ourselves in communication with the authorities, and carry out the necessary arrangements. Every member will receive a letter telling him what those are in exact detail, and enclosing a card which will enable every one to be present who desires to do so.

With respect to the other point of view in which I ventured to suggest we should look at this sad occurrence—viz.: the desire on the part of the Institute, individually and collectively, to place on record and in the hands of the family an expression of our feelings on the occasion, an Address of condolence, which it is proposed to send to Mr. Scott and the family at once, has been drafted. It is in these terms:—

> To Mr. George Gilbert Scott, M.A., to Mr. John Oldrid Scott, and to the other Members of the family of the late SIR GEORGE GILBERT SCOTT, R.A., Past-President of the Royal Institute of British Architects.
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> The President, the Vice-Presidents and the Council, the Past-Presidents and the Members of every class of the Royal Institute of British Architects, hereby desire to record their due appreciation of the loss sustained in the death of their colleague and Past-President, SIR GEORGE GILBERT SCOTT, R.A. They humbly deplore that it was not permitted him to complete even the seventy years of man. But that his life, comparatively short, was busy and eventful, his works remain to attest: half the cathedrals of England, and many an English village, preserve some memorial of his genius. New and important buildings in London, Edinburgh, and Glasgow; in other parts of this country; in Hamburgh, Newfoundland, and Bombay, bear witness to his skill. His great reputation, earned and closed by unremitting industry, is the growth of forty years. If, during that time, lost links in the chain of building tradition have been recovered, it is largely due to his diligent investigations. Efforts, in which he was zealously aided by many who survive him, and by a few who are gone, were it is true mainly concentrated upon methods of Architecture which he deemed National to England; but they have resulted in the advancement of all Art by fostering the study of every style. To-day, the archæologist who delights in the works of our mediæval countrymen is not less eager in research among the older ruins of Europe than among the traces of habitation in Egypt and Asia. In the kindling of such enthusiasm Sir Gilbert had a prominent share; in forming and directing the taste of students, who rarely sought his advice in vain, he was earnest and successful. Opponents, inevitable in the struggle for professional fame, but never personally other than friends, join in this imperfect homage to merit. That merit, it is our consolation to remember, did not remain without formal acknowledgement. At a time when the competition for conspicuous eminence is great and various, he has honourably worn the prizes of professional life. The Queen's Medallist in 1859, a Royal Academician in 1860, he became our President in 1873. He left the chair in 1876, strengthened by the kindliest sentiments of brethren and friends, whose wish and endeavour it has been, now Death has deprived them of a foremost man, that his mortal remains might repose in Westminster Abbey, with which for a score of years he has

been identified. United in the grave with great colleagues who have preceded him he will there rest amid associations he helped to render popular, and beneath the shadow of walls which to him were as an open book in the History of Architecture.

SEAL.

SIGNED AND SEALED on behalf of, and at the request of, the Vice-Presidents and the Council, the Past-Presidents and the Members in General Meeting Assembled, at the House of the ROYAL INSTITUTE OF BRITISH ARCHITECTS, this sixth day of April, in the year of our Lord one thousand eight hundred and seventy-eight.

(*Signed*) CHARLES BARRY,
President.

The Council have thought that Address would be esteemed by the family as an honourable heir-loom. I do not know that I ought to take up your time longer. All I have said hitherto has, however, been in my official capacity. Personally I feel very deeply indeed. I have known Sir Gilbert Scott all my professional life. We have come into competition more than once, but he never allowed professional emulation to interrupt private friendships, and that friendship in my own case has remained quite thorough and entire up to the present time. I had occasion a short time ago to address the pupils of the Sheffield School of Art, and in doing so I ventured to make a remark to this effect, that students of art have three branches of study presented to them, viz.: painting, sculpture, and architecture; that they need not go for inspiration abroad, but that they have great examples in each branch at home, which might be sufficient for all their needs. I instanced some of our departed friend's works as affording them examples in architecture, though I little thought at the time my words were so soon to receive an illustration in the loss we have now sustained. I am quite sure when the history of architecture is remembered in future times, the name of Gilbert Scott will appear foremost in the glorious roll of those who have "done well" and served their art in their generation, and it is our part now, as it seems to me, to take the first step —and a privilege it is to take that step—to do honour to Sir Gilbert Scott as one of the leaders of our art. I will not say more. I know there are gentlemen who are now here for the purpose of adding emphasis—and much more than emphasis—to what I have ventured to say, and will express themselves in far better terms than I can do.

Mr. A. J. B. BERESFORD-HOPE, M.P., Past-President.—I have been trying to persuade my honoured predecessor Professor Donaldson, that he is the person whose voice ought first to be heard, but as he will not agree with me in that, I apologize for rising now. The words which our dear friend the President said are those which I take to myself: my heart is very full. I am sure the suddenness of the event must have appalled us all. I heard of it myself in one of his own buildings —the Foreign Office—the other night. I believe I had a minute or two before been pointing it out to a young friend who had accompanied me as the work of Sir Gilbert Scott, when my informant said, "Sir Gilbert Scott is dead," I was so appalled that I believe he hardly knew that I recognized whom he was talking of. I gave an exclamation of such absolute incredulity. But it is no use going back upon that. Crowded within the sixty-six years of our friend's life we have an amount of work which few men of longer years can look back upon. It was the great and distinguishing peculiarity of Sir Gilbert Scott, that he was not only himself an indefatigable worker, but a worker all of whose

work told—who never hit wildly, but always brought things to bear. He knew what he meant to do, and carried it into execution; and not only that, he was a great administrator. He was a potent influence in any great movement. He was a centre of thought and action. He was, distinctly speaking, a representative man. That is a much abused word, but in his case it was peculiarly and curiously appropriate; and what we all know, and what the world does not know generally, is that with all that great weight of work upon him; with the determination to carry out what he believed to be right—for with him work and art meant duty—he did what he did from a conviction that he was doing right. He did what he did from a conviction that the eternal order of things combined form and proportion in things material as well as in things beyond the material. That was a great characteristic of our friend; but with all that we know how truly modest he was. If anything, he carried that out to a fault. He was anxious; he was often hurt in his feelings by things which he could afford to laugh at. That was the general characteristic of the man, and those who had not the privilege of his personal acquaintance very little appreciated it; and with all his zeal, all his earnestness, and all his conviction, he never bore malice. He would take blows and would give blows, as every man ought to do; but I repeat—he never bore malice. The real genuineness and affectionateness of his nature would vindicate itself above the petty clouds and cyclones of this most active and most turbulent art-world in which we all live. I am sure it was the instinctive feeling of every man when he began to realise what was to be done, that Westminster Abbey—as the great historical type of that architecture which Scott so loved, and as the place which he made his own by his tender care, by his judicious exploration, by his judicious restoration—should be his resting-place. In the few lines that I wrote to his son expressing my grief at what had occurred, I said distinctly his resting-place ought to be the Abbey, and I am sure, if Mr. Scott were to shew all the letters he has received, the great majority of them express the same sentiment. We thank you Sir, for the trouble you have taken personally; we thank you for giving us this sad privilege. I for one, in taking my share in it, well remember what I believe was the first funeral of a great man which I ever attended in Westminster Abbey. I have been there several times since, but I believe the first was the funeral of him who was a great architect indeed, but who was unhappily called away before he filled that chair, which we look upon you, Sir, as filling not only from your own deserts, but as his fitting representative. I beg leave to move the adoption of that Address which you have read, with thanks to the Council for having prepared it.

Professor DONALDSON, Past-President.—I rise to offer a few words on this occasion. My friend, Mr. Beresford-Hope, has said we do not require words in order to shew the deep sentiments which we experience, and I feel at this moment a great want of words to express how much I valued the character of Sir Gilbert Scott. I recollect his career very well. He began life as a pupil under Henry Roberts, as a pronounced Greek architect. He struggled on, and did not arrive at eminence at first. He passed through various phases of professional life, and by his honourable perseverance and energy of character arrived at that eminence which we all allow he was so worthy to occupy. There was much in the personal character of Sir Gilbert Scott which was very attractive, not only to his intimate friends, but to all who were professionally connected with him. He was candid, he was generous; and though, to a degree reserved, yet he sometimes exhibited an openness of character and an expression of feeling which were highly honourable to him and interesting to those who knew him. I join most sincerely in every expression of regret to which utterance has been given by our President and Mr. Beresford-Hope. I leave it to others to say more. I will only express how deeply I deplore the loss we have sustained, and to me it was a great shock when I first read the announcement of Sir Gilbert's death.

Sir Edmund Beckett, Q.C., Visitor.—I beg in the first place to express my thanks for the opportunity which has been given me for coming here to-night. Although at this period of the year I have not much time to spare, I have made an effort to attend; for I should be sorry that any meeting should take place on this subject at which I had not an opportunity of expressing my own feelings respecting our departed friend. I say departed friend, for I have the pleasure of recollecting that he has been my friend for twenty-five years. It is just twenty-five years since I was engaged with him in one of his greatest works in England—I mean Doncaster church; and from that time to the present I have very frequently been associated with him, sometimes in private works and sometimes in public ones; and I suppose there has never been a year, or scarcely half a year, during which I have not had some intercourse with him, especially of late, as you know, with respect to St. Alban's, and I remember the last time I spoke in this room was on that subject and in his presence. As to his public works it is superfluous to say anything. One may say of him in a wider sense than is said of Sir Christopher Wren in his own cathedral—"Si quæris monumentum circumspice;" for of Sir Gilbert it may be said—"Si quæris monumentum circumspice Britanniam;" for not only throughout England is his name known, but through Great Britain, and indeed over all the world. As you are aware, one of his latest works, not yet completed, was the new cathedral at Edinburgh, for which a very large legacy was left by two ladies; and it happens that I was professionally engaged in a Bill in Parliament for establishing the trust last year, and had to consider the plans, besides being since consulted about the bells for it. As to his numerous other works it would be idle to attempt to specify them. But this seems a fit occasion to ask the new school of anti-restorationists to carry their thoughts back thirty years, and consider what was the state of our English cathedrals then, and what it would be now if there been no Gilbert Scott. I would wish them to do that, because I am sorry to say, that from the modesty and timidity which Mr. Beresford-Hope has mentioned, Sir Gilbert was affected by the writings and sayings of that school; and though his arguments in reply to them were unanswered and unanswerable, the clamour of that school produced effects on him which were not completely satisfactory to those who were engaged with him in his works. In the matter of St. Alban's I know it did make him extremely timid, from the subjects I have discussed with him, in which his own good judgment was manifestly biased by the fear of what the people of that school might say. Let them remember what Sir Gilbert has done for the state of our English cathedrals, both in restoration and building. I think he will be most remembered for his restorations, for this reason, that almost every one who had a grand work to restore wished to consult him. Of the thirty-five millions of money returned to Parliament as having been expended upon church building and restoration, I should like to know how many millions were due to Sir Gilbert Scott, to his influence and advice, and the confidence people had that whatever he undertook would be well done, and the feeling that they might safely contribute their money without mischief being done with it. If he had not existed there might have been people to take his place, but we must take things as they are. The fact is these millions of money were subscribed by thousands, tens of thousands and fifties of thousands, from the confidence that people had in Sir Gilbert. Of course he was not immaculate nor perfect, but people were quite safe that from him they would have nothing vulgar, nothing in bad taste; they were sure to have everything preserved that was worth preserving, and so far as a building could be made equal to what it was before, it would be made so in his hands. Therefore he will be remembered in a way that no other man can be (because the work does not remain to be done) as the great restorer of our cathedrals and churches. As to his new works, it is a curious fact that his largest work in England was not in his own style of architecture, and that

his largest work in his own style was not in this country. It is a singular coincidence that two of our greatest architects were driven by circumstances to build in a style not their own—the result in the one case of public opinion, and in the other the ignorant whim of a prime minister. There are many of his works which singly and by themselves would make the fame of any man. I have already mentioned Doncaster church, to which may be added the chapels of St. John's College, Cambridge, and Exeter Chapel, Oxford, and the cathedral at Edinburgh, not yet developed; but these are not the only things on which the fame of Sir Gilbert Scott rests. One other point I would mention is the singular beauty of his private character. In the course of twenty-five years, especially with a wilful man like myself, it is only natural to suppose that differences of opinion would sometimes arise, but these differences were carried on amicably. I never had to deal with a professional man either in my own or any other profession who was so thoroughly candid, and ready to listen to anything, and ready also to confess he had made a mistake. I found that to be the case when I was young and learning from him what little I know about architecture. He would refer to books, and then write a letter to me saying he had made a mistake, and in any work he carried out he would never take credit to himself for what did not belong to him. As to his extreme modesty I may mention that in 1860 I went with a large party belonging to some society, I forget what, to pay a visit to Ely Cathedral. He took us over the building and showed us what he considered everything, except the reredos, which was his own work, and I had to return through a small door in order to see that reredos, which he appeared to have studiously kept from our sight. In conversation about his works he never took advantage of his own knowledge. I recollect a person saying to me on one occasion, "I cannot think Scott is a man of genius: he does not talk like one." I answered, "Don't you see what knowledge there is behind that talk?" He did not overwhelm you with noise and clatter, but he always imparted something that you did not know before. Among the many marks of a man of genius he had this striking one, of a passion for work. Sydney Smith said that there was no connection between merit and modesty but the alliteration; but in Sir Gilbert's case it was exceeding modesty combined with exceeding merit. He was the most honest, the most candid and forbearing, and in every sense the pleasantest man I ever had to do with professionally. I see by your notice we are invited to consider in what form and manner honour may be paid to Sir Gilbert's memory. There is hardly any question more difficult to decide than that. I am sorry to say I have seen a good many attempts to make a satisfactory memorial fail from difference of opinion. Far be it from me to dictate to you any form which this memorial should take, but you will permit me to say this. I had a letter from Sir Gilbert's son announcing his death, in which he states that the last professional instructions given by his father were with respect to St. Alban's. I can tell you more: he was carrying on a labour of love of his own—not directed by the committee, but a labour of love of his own—in the investigation of that wonderful west end of the Abbey, which some of you heard him describe on the spot in 1875 as the work of John de Cellâ. In his very last visit he inspected the results of those investigations; and I venture to say if the feelings of Sir Gilbert were known there is nothing to which he attached more interest and importance, and nothing he would more have delighted in than the restoration of that work, which he said was once the finest of its kind in England. The difficulty of determining upon the form of memorial of any great man is proverbial and notorious, and very frequently those attempts fail. There is difficulty in raising money for a memorial before it is known what you are going to do; people will not subscribe without knowing what you are going to do. On the other hand, if it is your wish to do what a man had nearest his heart—a thing which would still further connect his name with future ages—then no one would hesitate to join in it. At the present time we do not

know how much money it would take to make this addition to an already great work; but it had been estimated by Sir Gilbert roughly, that to carry out the restoration of that west end would cost about £9000. If I had to do with the making of a memorial to anybody, or to myself, I would say, attach his name or my name to some work already great in itself. £9000 in a new work would do very little, but the same amount expended in the restoration of one of the finest works in the country, on which the last of Sir Gilbert's professional thoughts were engaged, would produce a very different result. I should be glad to join in that myself, and I think it would be difficult to find anything more appropriate.

The PRESIDENT.—I am not surprised at the concluding remark of Sir Edmund Beckett, but I think I said the words of the notice calling you together were put together hurriedly. We did not contemplate the consideration of that question which I think most will feel is at the present moment somewhat premature. That some mark of appreciation in one way or other will hereafter take place I think is extremely probable. If Sir Edmund Beckett, or any other gentleman, feel sufficient confidence in the Council to address them in a written form, I need not say they will take up the question with the most thorough desire to meet their views; but we are only met now to deal with the immediate question of this week's work. I omitted to state one thing which I ought to have done, and for which I apologize: that is, that in the procession of the funeral there will be a carriage sent expressly by Her Majesty, an intimation that I am sure you will all receive with a great deal of satisfaction.

Mr. ALGERNON B. MITFORD, Hon. Associate.—I have attended here to-night, not only on my own behalf, but also on behalf of my chief, the First Commissioner, to express his great regret that his duties in the House of Commons prevent him taking part in your deliberations regarding the best means of paying honour to the memory of so distinguished a public servant as Sir Gilbert Scott. To myself, personally, it must always be a matter of melancholy recollection, that the first time I have had the opportunity of availing myself of the privilege of coming to this Institute should be when you are assembled to mourn over the sudden extinction of so great a light of architecture; and the recollection is rendered still more sad when I think that Sir Gilbert Scott, when I was a candidate for admission to your privileges, was one of those who were good enough to stand my sponsors. The connection of Sir Gilbert Scott with the Office of Works has been one not of recent, but of long standing, and could only have been severed by death. It was impossible that the Office of Works should not have continued to have availed themselves of the wisdom of a man like Sir Gilbert Scott so long as that wisdom was at their service. It would be perfectly unbecoming in me if I were to endeavour to do more than add my humble tribute of praise to those words which have fallen from the President, who knew him so long and so well, to the words of Mr. Beresford-Hope, or to the words of Sir Edmund Beckett; but this much I may be allowed to say—having had to consult the records, to which I have had access, of the Office of Works, they are one tribute, so far as they relate to Sir Gilbert Scott, to the uprightness and nobleness of his nature. As to that there can be no two opinions; and it was only this morning I was talking over this lamentable event with one who had been associated with him for forty years in the closest ties of intimacy and business. He alluded, as Mr. Hope has done, to the intense uprightness of the man; he alluded to his intense trustworthiness and loyalty in business, corroborating to the fullest extent those records to which I have alluded; and he ended by saying, in all his life he never came across a more perfect type of a truly christian gentleman. I do hope, and it is the hope of my chief, that you will allow us to be associated in any steps that you may take to do honour to this great man's memory.

The PRESIDENT.—Am I to understand that it is the wish of the First Commissioner for the Office of Works to be officially represented at the funeral?

Mr. MITFORD.—It is his wish; and although he may be unable to attend himself, he desires that the Office of Works should be represented officially, and in that case I shall probably have the honour of representing them.

Mr. G. E. STREET, R.A., Vice-President.—I cannot allow this occasion to pass by without tendering my humble tribute of respect to the memory of Sir Gilbert Scott. It happens, I believe, that out of the many assembled here to-night, I am one of the oldest who learnt some of their earliest lessons in architecture from that great man. Sir Edmund Beckett describes his acquaintance as extending over a quarter of a century; mine extends over half the lifetime of Sir Gilbert. It is just thirty-three years ago since I first worked under him, and I can truly say that his extreme kindness and amiability to the young men in his office were such as to impress them very deeply. He was at all times during my official connection with him most kind and considerate to myself, as well as to all under him; and I am quite sure that feeling will be endorsed by all his old pupils. From that time our intercourse has been one of undisturbed pleasure on my part. He was always most kind and amiable in all conferences and discussions we have had together on matters of taste. Indeed I have always felt that his modesty was much too great. He always wanted to assume that everybody knew as much about matters, of which he was master, as himself; and I am sure, if there is anybody in the room who has had the same relations with Sir Gilbert as I have had, he will confirm what I have stated. This is not the occasion to say more. My heart is full of the memories of the kind friend we have lost; but I should be sorry, on such an occasion as this, not to take the opportunity of expressing the deep sense I in particular have of the loss we have sustained.

Mr. BODLEY, Visitor.—I gather from the circular of invitation with which I have been favoured, that we are here assembled to do honour to the memory of Sir Gilbert Scott, which I am most anxious to do. I suppose I am one of his oldest pupils, and I am sure I cordially concur with all that Mr. Street has said, both as to his character and amiability.

Mr. JOSEPH CLARKE, F.S.A., Fellow.—Although not a pupil of Sir Gilbert's, I have been associated with him almost as long as Mr. Street. We were fellow-workers together for many years, and I have been associated with him for twenty-five years, I think, in the Architectural Museum. I heard just now the idea was entertained that, when the subject comes to be considered, it might be suggested to adopt some memorial of our departed friend in connection with St. Alban's Abbey; but knowing as I do, well and fully, how heartily he went into that work, I hope there will be something thought of in regard to the Architectural Museum, which stands in need of succour, and I hope it will not fail to obtain that succour through Sir Gilbert Scott's death. I am quite sure, at the proper time, we shall be called together to express our opinions as to the material way in which Sir Gilbert's memory shall be perpetuated amongst the profession. There is one thing which has not been alluded to. I happened to sit next to Sir Gilbert on the occasion of his portrait being presented to the Institute. We had then the living man amongst us, and I am sure it will be regarded by all as a most gratifying circumstance that we are in possession of Richmond's portrait of Sir Gilbert to perpetuate his memory in this room, and I hope, when we meet on another occasion, we shall be prepared to do that to contribute to his fame which is done in other professions.

Mr. EWAN CHRISTIAN, Fellow.—Every man present I am sure feels that a great man and a prince amongst architects has fallen. I have known Sir Gilbert, perhaps quite as long as Mr. Clarke, and we have worked together since the first foundation of the Architectural Museum: but there is

one thing which you may not all be acquainted with—that is the very kind way in which Sir Gilbert was ready to meet classes of working-men at the Museum, and give them every information in his power. I happen to have been connected, as he was, with a class of working-men at Hampstead; last summer, at the request of the secretary of the class, we met at the Museum, and on that occasion Sir Gilbert devoted the whole afternoon to shewing those men everything to be seen of value in the Museum, and the kind way, and the laborious way, in which he did it was delightful to see. It was highly appreciated by the men, and could not be otherwise by everybody who was there. But anybody who knows the history of that Museum knows how heartily Sir Gilbert exerted himself in preserving its interest; and though I can only speak very poorly on such a subject, I do not like to withhold a word of tribute to his zeal and energy in the prosecution of a work which he thought of such great importance. As to his kindness of manner to all who came in contact with him it is not necessary to say a word. He was the kindest of men, the pleasantest of men, the most delightful companion any man could have in any archæological expedition, as I myself experienced in going over Fountain's Abbey with him—full of knowledge, full of sympathy, full of enthusiasm, up to the last moment of his life.

Mr. Ralph Nevill, F.S.A., Fellow.—As an old pupil of Sir Gilbert Scott's, I am very gratified to say how much I agree with what Mr. Street has said with reference to his treatment of those under him. We must all, I am sure, remember with great pleasure the forbearance he exercised, the care he took in our instruction and the best way to direct our studies. What I wish more particularly to notice is the enormous amount of work he got through, and the way in which he did his own work, and not as some may have supposed, allowed it to be done by others in the office. Whoever has been engaged in his office, will bear me out in saying that on all occasions every drawing and every single detail of work in his office went through his hands and was submitted to his judgment. People may think with such a large business, and a multitude of small as well as large buildings, a great deal of work was done in the office which he himself knew very little about; but that is a great mistake, and it is a marvel, knowing the amount of work he had to do, how he got through what he did. Those who had only a small church to restore might be sure that they had Sir Gilbert's own work, and not the work of others in his office.

Mr. J. J. Stevenson, Visitor.—I can only say that, when my old friend Mr. Gilbert Scott wrote to me informing me of his father's death, the news filled me with astonishment and sadness. I thank Mr. Scott for including me among those who are sorrowing for the great loss they have sustained.

Mr. Micklethwaite, F.S.A., Visitor.—As a pupil of Sir Gilbert Scott's, and having worked under him for twelve years, I would beg to say a few words on the subject of restoration. Having worked with Sir Gilbert in some of his larger restorations, the conclusion at which I arrived was that he had a knowledge of the details of church architecture which I suppose was never equalled. He could restore a design from a few remains with a skill that ensured a very close resemblance to the original work, and that faculty may have tempted him to carry out the work of restoration to a greater degree than modern criticism approves of. On the other hand there are two or three things to be considered. In the first place, the custodians of a building on which Sir Gilbert was employed would not have allowed him to do anything else than restore it in the manner he did, and those restorations he treated as he did would, in all probability, have been done much worse if he had not done them, or if they had been done by men who did not possess his skill. I endorse all that has been said of the personal qualities of Sir Gilbert Scott, from a long experience of them.

Mr. Charles L. Eastlake, Fellow.—I regret extremely that the first Meeting which I attend

here since my retirement from office should be convened for so melancholy a purpose as the present, and that the first Discussion in which I join, as an ordinary member, should relate to so painful a subject. It is especially painful to me when I remember that, while I was Sir Gilbert's guest at Ham, a few years ago, he was attacked by a sudden illness—perhaps the first indication of that infirmity which has terminated in his death, though until quite recently there does not seem to have been any serious ground for alarm. I should be sorry to leave this room to-night without saying a few words by way of respectful tribute on my part to Sir Gilbert Scott's memory. His professional talents, and indeed his private virtues, are so well known, and have met with such ready recognition from all present, that I could add little or nothing to what has been already said on those points. But, perhaps I may be permitted, as your late Secretary, to refer briefly to the position which Sir Gilbert held as President of this Institute, and to acknowledge, as I do most gratefully, the kindness and courtesy which he invariably showed to me throughout our official relations. There are occasions, as we all know, when in carrying out the instructions of the Council or governing Body in such a society as this, the Secretary needs the support—the direct and definite support of the President. Such support Sir Gilbert, notwithstanding his natural diffidence and characteristic reserve, never failed to give, and I can truly say that, both during the term of his presidency and subsequently, I found in him what no one can prize too highly—whether in public or private life —the generous adherence of a staunch and loyal friend.

Mr. Edis, F.S.A., Fellow.—I am neither a pupil of the late Sir Gilbert Scott, to whom we are met here to-night to show how best we can pay respect, nor one who, like other speakers, can be said to have been on terms of great intimacy with him. I, however, knew him well, and as an outsider desire to express my best testimony to his worth. I have had many opportunities of hearing the kindly manner in which Sir Gilbert has always been spoken of, and know well the great service he has rendered to our profession. To his thorough uprightness, honourable conduct, straightforward manner of life and work the profession is largely indebted. Sir Gilbert's practice tended in many ways to raise the status of the profession in days when the public generally neither understood nor appreciated its work or followers, and in his death we have lost one who through a long and varied career sought in every way in his power to aid and benefit the profession to which he belonged. Sir Gilbert, as an artist, not only did much by his work to win for himself and the profession of which he was so great an ornament a proper and large appreciation, but by his conduct throughout a long and successful career he helped to win for the ranks of English architects a just and proper recognition in all parts of the world. In his death all architects have lost an honoured colleague, and all young professional men a true and thorough friend and adviser.

Mr. J. Edmeston, Fellow.—It would be a pity that a mistake should go forth uncorrected. Therefore allow me to say that Sir Gilbert Scott was not articled to Mr. Roberts as stated by Professor Donaldson, but he was articled to my father, as also was Mr. Moffatt at the same time; and I remember them both living in the house perfectly well.

The President.—There is, as you are aware, a motion before the chair for the adoption of the Address to the family of Sir Gilbert, which has been read to you. That motion formally requires a seconder, though I am sure any member will be ready to do so.

Professor Donaldson.—I rose for the purpose of seconding it and thought I had done so; if not I shall be happy to do so now.

The motion was then unanimously adopted, after which the Meeting separated.

The following letter was addressed to the Very Rev. the Dean of Westminster, an Hon. Associate of the Institute, by order of the Council, and a copy of the Address before mentioned was enclosed :—

Royal Institute of British Architects,
9, *Conduit Street, Hanover Square, London, W.,*
8th April, 1878.

Dear Mr. Dean,

I have the honour to enclose a copy of the Address voted at a Special Meeting of the Institute, held on the 1st of April last, to the family of the late Sir G. Gilbert Scott. The "wish and endeavour" expressed in that Address were early communicated to you by the President, and the Institute knows that you had generously expressed in private a similar wish.

Great satisfaction was evinced during the proceedings of our Special Meeting that you, Sir, an Honorary Associate, had anticipated the wish and endeavour of the general body of Members.

I am, dear Mr. Dean,
Yours very faithfully,
WILLIAM H. WHITE,
Officiating Secretary.

The Very Reverend
The DEAN OF WESTMINSTER.

London, April 1st, 1878.

The President of the Architectural Association to the President.

Dear Sir,

I have been requested to apply to you for permission to allow the above Society to be officially represented at the funeral of Sir Gilbert Scott, on Saturday next. I have no hesitation in saying that the regret, expressed by the senior members of our profession, at your Meeting this evening, is also shared in by the eight or nine hundred junior members comprising the Architectural Association. We have frequently received kindnesses from the hands of him whose loss we now so deeply deplore, and it will be a melancholy privilege to some of us to be allowed to share in the last marks of respect to one who was such an ornament to the profession, such a devoted lover of his art, such an enthusiast in his work, such a courteous gentleman, and one who was ever ready to assist the student in the advancement of his studies.

Trusting that the application will meet with your approval,

I remain, dear Sir,
Yours faithfully,
BOWES A. PAICE.

CHARLES BARRY, Esq.
President of the Royal Institute of British Architects.

THE FUNERAL.

At a Special Meeting of the Council, held on Saturday the 6th of April, 1878, at 10 o'clock, A.M., the Address from the Royal Institute of British Architects to Mr. George Gilbert Scott, M.A., to Mr. J. Oldrid Scott, and to the other members of the family of the late Sir Gilbert, was signed and sealed in accordance with the resolution of the Council adopted by the Institute on the 1st of April previously. After the signature and seal had been affixed, George Godwin, Past Vice-President; Arthur Cates, Fellow; James Edmeston, Fellow; and Sir Edmund Beckett, Visitor, were introduced to the President. These four gentlemen, representing respectively the Architectural Press, the Architectural Publication Society, the Architectural Union Company, and the Royal Architectural Museum, accompanied the Council—and all dressed with the insignia of mourning, in six mourning coaches—to join the funeral procession to the Abbey and to follow the body of the deceased Past-President to the grave.

The funeral of the late Sir G. Gilbert Scott, R.A., Past-President, was solemnised in Westminster Abbey, on Saturday the 6th of April, 1878. The body was laid beneath the nave, close to that of Sir Charles Barry, at the foot of the pulpit designed by Sir Gilbert. All the members of the Institute were invited to attend the funeral, and a special deputation assisted in the formal honours paid to the memory of the deceased.

The deputation consisted of—

CHARLES BARRY, F.S.A., *President.*

E. B. FERREY (for his father, Benjamin Ferrey, F.S.A., *Vice-President*).

JOHN WHICHCORD, F.S.A., *Vice-President.*

A. J. B. BERESFORD-HOPE, M.P., *Past-President.*

PROFESSOR LEWIS, F.S.A.		GEORGE VULLIAMY.
HENRY CURREY.		J. L. PEARSON, A.R.A.
JOHN GIBSON.	*Ordinary*	A. W. BLOMFIELD, M.A.
ALFRED WATERHOUSE, A.R.A.	*Members of*	DAVID BRANDON, F.S.A.
EDWARD I'ANSON, F.G.S.	*Council.*	JOSEPH CLARKE, F.S.A.
EWAN CHRISTIAN.		OCTAVIUS HANSARD.
HORACE JONES.		FRED. P. COCKERELL, *Hon. Sec.*

GEORGE GODWIN, F.R.S., F.S.A., *Past Vice-President.*

CHARLES L. EASTLAKE, *late Secretary.*

WILLIAM H. WHITE, *Officiating Secretary.*

JAMES EDMESTON, *Fellow.*

ARTHUR CATES, *Fellow.*

SIR EDMUND BECKETT, Bart., Q.C., *Visitor.*

LORD CREWE, *Hon. Associate*, joined the deputation at the door of Westminster Abbey.

The PRESIDENT of the ARCHITECTURAL ASSOCIATION, and three representative members were also introduced to the President; attired in the insignia of mourning, they accompanied the deputation to the Abbey in one mourning coach. Their names are—

BOWES A. PAICE, *Associate* (*President of the Architectural Association*).
T. W. CUTLER, *Associate* (*Senior Vice-President, Architectural Association*).
J. DOUGLASS MATHEWS, *Fellow* (*Treasurer, Architectural Association*).
E. G. HAYES, *Associate* (*Senior Honorary Secretary, Architectural Association*).

The following gentlemen, members of the Institute and of the Architectural Association, acted as "doorkeepers" and assisted in maintaining order during the passage of the procession through the Abbey:—Charles Fowler, F. T. Dollman, J. S. Edmeston, Jun., Lacy W. Ridge, H. H. Stannus, R. C. Page, and W. G. Davie.

The Pall-bearers were—

A. B. Mitford, *Hon. Associate (for the First Commissioner of Works).*
The Right Hon. Lord John Manners, M.P., *Hon. Associate (Postmaster General).*
Mr. R. Redgrave, R.A. *(for the President of the Royal Academy).*
Charles Barry, F.S.A., *President.*
Frederick Ouvry, F.S.A., *Hon. Fellow (for the Society of Antiquaries).*
A. J. B. Beresford-Hope, M.P., *Past-President (for the Royal Architectural Museum).*

At the Ordinary Meeting of the Session, held on Monday evening, the 15th April, 1878, the President read the following letter he had received from Mr. J. Oldrid Scott:—

31, *Spring Gardens, London, S.W.*,
April 13, 1878.

My dear Sir,

I beg on behalf of myself and the members of our family to offer to you and to the Institute our very heartfelt thanks for the honour done to my father's name by your presence at the Abbey last Saturday.

The great gathering of architects on that occasion was indeed a noble tribute of respect for him whose remains they followed to that appropriate resting-place.

I cannot omit to thank you personally for all your kindness and trouble in connection with this sad event.

Believe me,
My dear Sir,
Yours very faithfully,
John Oldrid Scott.

Charles Barry, Esq., *President.*

Royal Institute of British Architects.

At the Ordinary Meeting (postponed) of the Session, held on Monday Evening, April 8th, 1878, CHARLES BARRY, F.S.A., President, in the Chair, the following business took place :—

DISCUSSION ON MR. CONDER'S PAPER—NOTES ON JAPANESE ARCHITECTURE.

The PRESIDENT.—I have to ask gentlemen who have made themselves acquainted with Mr. Conder's Paper, to open the Discussion upon it. We have received a model which is before you, and which I presume is Japanese work, from Mr. Cutler, our Associate. He has also sent some very excellent photographs of Japanese buildings and scenery.

Mr. WILLIAM KIDNER, Fellow.—I can add nothing to what has been written by Mr. Conder on Japanese Architecture, nor am I able to raise any fresh questions respecting this subject. I can only speak as to the extreme accuracy of the descriptions given, and to the evident pains Mr. Conder has taken in preparing his Paper. During a residence of many years in China, I have on many occasions gone across to Japan when I have been invalided, or I have gone there to spend a week or two of cessation from business and for purposes of recreation. I have not been there to study the architecture, but it is impossible for an architect to go there without learning something about the buildings. I was not present when the Paper was read, but I was particularly interested in reading the excellent description of the Shiba Temples. Mr. Conder apologises in a way for what he modestly calls his deficient means of observation, but I think his observations have been most discriminating and his account of the buildings is as exhaustive and clear as it can be. To properly appreciate these buildings they must be seen. What will strike the traveller in Japan is not so much the buildings, of which the Shiba Temples are a type, but the extremely artistic feeling which pervades the country throughout. It does not matter how small a building is or how unimportant its purposes are, it is sure to be characterised by great artistic feeling. There is one little point of detail which occurred to me when I was in Japan last. Whether I am right I am not prepared to say, but one noticeable point in all the timber work in Japan is that whenever rectangular in section, it is always absolutely square, whether it be rafters, joints, posts, or palings. The corners may be somewhat enriched by rounded mouldings, but it is certain to measure the same on one surface as the other. The way in which they combine these square timbers together is beyond the imagination of those who have not seen them. By different arrangements of lengths, different spacing, and different disposition of the horizontal rails they make a really beautiful fence, consisting of nothing but plain square rails of deal. The architecture of Japan is chiefly wooden, but you must not suppose that is because there is any lack of skill on the part of the people in working stone. That is not the case, but still the buildings are chiefly wooden, to meet the inexpensive and economical

habits of the people, and because that kind of construction is more capable of withstanding the frequent shocks of earthquakes that occur there. Mr. Conder speaks of the addition of stone for the bases of the temples, and in the city walls. I know of nothing which struck me more than the extreme magnificence of the gateways and walls that surround the Mikado grounds at Osaka. They are built to the height of from about 40 ft. to 50 ft., with stones of enormous size, in all kinds of irregular straight-sided figures, fitted with the greatest nicety and tooled in a slightly convex form making light and shade over the whole face of the wall. As to the style of architecture, which Mr. Conder seems to have a doubt about, I think there can be no doubt it originally came from China. In all its main features it is essentially the same as in China, but it is treated by the Japanese with greater vigour and artistic feeling; and the differences observable are such as would naturally result from such a cause. I think one of the advantages to be gained from this Paper will be to impress the Japanese with the beauty of their own work and induce them to do more to preserve it. Everyone is aware of the revolution which is now taking place in the customs and manners of the Japanese. I recollect the country when things were very different. Western institutions have been now adopted, and even a western style of building, not always so well fitted as their own for the conditions and habits of the people. Some of the beautiful bronzes of which Mr. Conder speaks seem in many cases to have been undervalued. I have seen tons of them battered and broken up to be exported as old metal. If they had not been so battered they would have been liable to the curio tax. I cannot tell you anything about the construction of Japanese buildings. The people themselves are a most exasperating race to do business with, and they have sometimes very little idea of keeping faith with engagements. They may be artistic, but nothing else. I may add that the term "Godoun" is applied to buildings of the character of warehouses.*

Mr. HANSARD, Fellow, inquired whether Mr. Kidner could inform the Meeting of the meaning, if any, of a kind of symbolical figure which appeared in many of the photographs in the cross beams of houses and in the architraves of some of the temples. Was it a sacred symbol?

Mr. KIDNER replied that what Mr. Hansard referred to was a pailow which was erected in commemoration of widows who had led a chaste life. If a woman committed suicide on the death of her husband it was regarded as the most virtuous thing she could do.

Mr. R. PHENÉ SPIERS, Fellow.—Since this Paper was brought before the Institute, I have examined many of the drawings and photographs by which it is illustrated, and I have always been somewhat interested in Japanese work. The subject reminds me of a book published some time ago on Ireland, which the author divided into sections. One was on the snakes of Ireland, and the subject was dismissed by saying, "There are no snakes in Ireland." I am afraid, with regard to the architecture of Japan, there is no architecture, as we understand it: that is, whatever there may be in decoration, in dress, in objects of art, and in other works in Japan, from the architecture of the country we shall learn scarcely anything. The fact to which Mr. Kidner alluded of the frequent recurrence of earthquakes, seems from time immemorial to have necessitated construction of two kinds: one foundation-work only of stone, and the other a very light fabric of wood above it. The evidence that the main portions of the buildings are of wood has probably conduced to the fact that they have no lasting architecture—no lasting style; have never been able to realise any grand conception which would last for all ages. Of stone architecture for walls and

* "Godoun" is the Anglo-Indian word for a merchant's store or warehouse; and it is probably an expression of the same category as "compound," "tiffin," and like corruptions familiar to inhabitants of the Indian Metropolis.

foundations there are three kinds: the first is that of foundations which are only a few feet in height; secondly, the fortifications, which sometimes rise to the height of forty feet, in which they occasionally use very large stones; the third employment of stone is for bridges. There is one known as the spectacle bridge, which is about twenty-five feet across, the water passing through two large circular holes about eight feet in diameter. The joints of the *voussoirs* of the arch are well formed. The walls of the fortifications are sometimes very lofty; the upper portions are fortified with wood, and there is scarcely any architecture proper in them. The model on the table is that of the entrance portion of a storehouse—a kind of building which every Japanese of wealth has to store away his valuables. But for these storehouses or "godouns" a large portion of the artistic products of the country, stored in them, and only brought out occasionally to show to friends, would have been lost—the houses being of wood, and therefore a constant prey to fire. The Paper itself is one which reflects great credit upon the author. It is certainly the most complete account we have yet had of the architecture of Japan.

Mr. WYATT PAPWORTH, Fellow.—There are two points which, after the remarks we have just heard, would make the Paper more complete. One is, if Mr. Conder, or the gentleman who spoke first, could furnish us with the architectural measures used for building in Japan. There are two mentioned in the Paper: one is called "ho," and the other "cho;" but there is nothing to show their relative proportions, although some of the dimensions are given by English measurement. As it would take some months to obtain this supplemental information from Mr. Conder himself, if our friend who has spoken to-night could furnish it to go out with the Discussion, it would make the Paper more complete.

Mr. KIDNER.—I have no idea whatever of the measurements in Japan. In China we always used the English foot. I know the Chinese foot is about eleven inches, all their measurements being upon the decimal system.

The PRESIDENT.—It occurs to me that if, as Mr. Spiers has said, there is no architecture in Japan, there is at all events a great deal of fancy and imagination displayed in the uses of their wood. The Japanese, until of late years, have been regarded as an entirely self-contained people, knowing nothing of their neighbours or the rest of the world. This exclusiveness, as we know, has been to a great extent broken through, and they have taken frequent opportunities of becoming acquainted with what is going on in other parts of the world, particularly in Europe, and more particularly in England. [The President then referred to the model lent by Mr. Thomas W. Cutler, Associate.]

Mr. SPIERS stated that the model in question illustrated the following description of the construction of Japanese Houses, given by Mr. Conder in his Paper:—"The walls are constructed of a vertical and horizontal framework of posts and beams morticed together, filled in with bamboo laths, laid crossing, bound together, coated with mud in several layers, and finally plastered over. Sometimes the beams and posts shew, being flush with or projecting beyond the plastered surface, and sometimes the whole is plastered over, framework and all. This latter method is employed in larger buildings, and in the "Kuras" or Godouns. A Kura is often many months in building: the mud, which is taken from the bed of some river, being spread over the framework in a great number of layers, and each layer being allowed a long time to harden. The projecting timbers at the eaves are also thickly coated with the same clayey mud, and to the small window openings are hinged shutters coated to a very great thickness with the same material. The whole surface of the building is then plastered over and finally covered with a coating of lacquer. These Kuras often remain standing after street fires, but they are by no means thoroughly fireproof, for the mud

often cracks and falls off with great heat, and even under ordinary circumstances they require constant renovation and repair."

The Discussion terminated with a vote of thanks to Mr. Cutler.

Professor Donaldson's Paper on Obelisks, which was illustrated by numerous drawings and photographs, was then read by the Officiating Secretary, the President having expressed to the Meeting his regret that the learned Professor was too unwell to attend. It will be found on the following page.

ON OBELISKS, THEIR PURPOSE, PROPORTIONS, MATERIAL AND POSITION.

THE generous patriotism of Mr. Erasmus Wilson and the skill of Mr. John Dixon, C.E., have triumphed over the half a century of England's indifference, and now the monolith of Alexandria is in the Thames only awaiting, after much discussion and difference of opinion as to its proper site, to be erected in the very centre of our Metropolis as an evidence of the grand ideas of the ancient Egyptians in regard to monumental art. Considering how intimately obelisks are connected with our pursuit, I have felt that it would hardly become our Institute, if such an historical fact were unnoticed in our annals, and if some attempt, however brief, were not made by us to get together the leading points connected with the general subject of obelisks, their purpose, proportions, material and position, treated from a strictly architectural point of view, without encumbering ourselves with the questions relating to precise dates, or intricate calculations of dynasties, or to hieroglyphics.

They are the most simple monuments of Egyptian architecture and among the most interesting that antiquity has transmitted to us, from the remoteness of their origin and the doubt in which we still are as to the period when first set up. The oldest, which now remains to us, is still standing at Heliopolis near Cairo—the On Ramses or Beth-Shemesh of the Hebrew Scriptures. Abraham was unborn, the Pentateuch of Moses was not written, when the inhabitant of Heliopolis adored his gods in the temple of the sun, and read upon the obelisk still in its place the name of Harmachis and that of King Usertesen, who then reigned and reared it, and to whom Mariette Bey assigns the date of 2851 years before Christ. He was a powerful Pharaoh, whom eleven royal dynasties had preceded, and who was followed by twelve more, when Alexander the Great, about 380 B.C., came to consult the oracle of Ammon, and to found at Alexandria the capital of his future Egyptian Empire. They are supposed to have been principally dedicated to the sun Horus, of whom the hawk was a symbol, on account of the elevation to which this bird extended his flight, and of the faculty, which the ancients considered it to have, of looking at the sun with a steady gaze. Pliny says, " That the Egyptian term for an obelisk conveyed the idea of a sun's ray, which its form was supposed to symbolise." The term obelisk is derived from the Greek term obelos, which meant a spit, a term which the witty epigrammatic Greeks gave them, with the view, like all wits in such cases, to cover with an air of ridicule what they could not controvert by reason.

Obelisks have been, from the earliest periods of antiquity, regarded as remarkable monuments of the skill and perseverance of remote ages. They must ever be considered as valuable records of the ancient history of the Egyptians and of the skill of those periods; monumental evidences of their sovereigns and of their warlike exploits. Extracted with vast labour from their quarries as monoliths, conveyed six or seven hundreds of miles down the Nile and erected with difficulty in front of their temples, they are emblems of the perseverance and love of glory of the Egyptians or their rulers. The very fact of their being transported to Europe by the ancient Romans under their Emperors, shows the high value in which they were held by that people, as witnesses of their own world-wide victories in remote regions, and as proofs of the estimation in which they were regarded by the very conquerors of Egypt. They became trophies of the successes of the arms of the Romans and of their determination to grace their conquests by the transport and erection of these huge monoliths in their central city of the then civilized world. Overthrown by earthquakes or the violence of conquerors, buried in the sands or encumbered by the enormous blocks of stone piled up to great heights, the

city of Thebes, even in its dilapidated state at the present day, is the marvel of the traveller for the extent and dimensions of its ruins. The ancient city, divided in its middle by the Nile, as London is by the Thames, presents two gigantic towns with remains of immense temples, which in all their accompaniments and parts are colossal whether in the dromoi or avenues leading up to their entrance portals, their statues, their courts and colonnades, in the hypostyle halls, and though last not least, as objects of wonder, in their stupendous obelisks. These were lofty pillars of granite set up by the kings in front of their temples and to commemorate their victories and record their various names and titles. I am not aware that they have as yet been found in front of tombs, as suggested by Mr. Basil Henry Cooper in his learned Paper recently read before the Society of Arts. They were monoliths consisting of a square shaft gradually diminishing towards its summit up to about nine diameters high, where the faces suddenly receded up to a point, their upper portion being called a pyramidion from the similarity of its general form to that of a pyramid, though much more rapidly sloping. I have said receding up to a point, but the fact is, that there is authority for assuming, that sometimes the pyramidion had a seated figure on its top, whether of the king and one of their gods.

The Egyptians set great value upon the size of their monoliths, and if a large block were extracted from a quarry not quite corresponding in all its sides, whether as to size or form, they would without scruple use it for their immediate purpose, or shape it as near as possible to the object they had in view, without diminishing its size. The consequence is that many of their obelisks, pedestals and sarcophagi even, where one would have supposed the most scrupulous attention to uniformity should have existed, are irregular in shape. In like manner some of the huge blocks intended for obelisks came out of the quarries mis-shapen at the smaller end, and to remedy this defect they covered it with a metal capping of the required shape rather than reduce its length by cutting off the rugged portion.

The summit of the Parisian obelisk was irregular in shape, and left quite rough. There was at bottom of the pyramidion a chanel and fillet, then a surface setting back, and the granite presenting an uneven face. It was in the same state previous to its being lowered by the French. There must have been something to cover this unsightly appearance. An Arab writer, Mohamed, son of Abdarrahim, says, in a work entitled "Tohfal Allabab," translated by De Lacey: "That one of the obelisks of Pharaoh, which were at Mataria, near Cairo, fell down, and a great quantity of copper was taken from the top." Reference is also made by Kodhai to two obelisks in the city of Heliopolis, as "being extremely wonderful. On their summit are two pointed caps in copper. When the Nile overflows, water flows from their summits from beneath the bronze coverings, and descends to about the middle of the column (obelisk); this part is green." And again: "This obelisk is square, formed of a single block, pointed at the top, which is a covering of copper as yellow as gold, above which is the figure of a man sitting in his chair looking at the rising sun." Our obelisk has an inscription, translated by M. Chabas from the transcript of Burton's "Excerpta Hieroglyphica," pl. 51. In it is the following line:—

"HE ERECTED TWO VERY GREAT OBELISKS CAPPED WITH GOLD."

Mariette Bey mentions that round the lowest part of the obelisk of Hatasou runs an inscription in horizontal lines covering the whole of its four sides, which states that the summit of the obelisk was covered over with pure gold, taken from the chiefs of the nation; and he observes that, unless this expression simply implies an apex overlaid with a casing of gilded copper, as the top of the obelisk must have been, this inscription possibly refers to the sphere of gold (?) which is represented

on certain bas reliefs at Sakkarah. He further says: "The obelisk was no doubt gilded from top to bottom." In examining closely, one may notice that the hieroglyphs were carefully polished, and moreover that the plain surface of the monument was left comparatively rugged, from which it may be inferred that it had been covered with a coating of white stucco, as so many Egyptian monuments were, which alone received this costly embellishment of gilding, the hieroglyphs themselves retaining the original colour and actual surface of granite. Dr. Birch mentions (p. 103) that the tombs in Libyan range behind Gournah and El-Assasif "are full of scenes of the reign of Thothmes. Two great obelisks of 188 cubits high, with gilded tops! are recorded in these sepulchres." Mariette Bey also says that "the inscription further states that the two granite obelisks of Heliopolis were actually completed and erected in seven months from the very beginning, when first extracted from the quarry in the mountain." This use of bronze caps seems to justify the practice in modern times, as the ancient Romans possibly adopted in certain cases the same practice; and this has been handed down traditionally to our period.

When the pyramidion was perfect in its shape, and required no artificial capping, it was sculptured in sunk relief, with a representation, as on the Alnwick Obelisk, of the god to whom the monument was dedicated, before whom was the king kneeling and presenting his offering, or by a group consisting principally of a sphinx on a pedestal in front of a deity seated on a throne. A very fine example of the apex of an obelisk, at Karnak, is to be seen in the full-sized cast of one side of a pyramidion, on the landing at the top of the staircase leading to the Egyptian Room, in the upper gallery of the British Museum. Imposing from its size and execution, it shows the bold depth of the hieroglyphs and rounded surface of the sunk character, polished, as Mr. Erasmus Wilson suggests, like the delicate carving of a gem.

The next division of our subject relates to the shaft of the obelisk. The sides were not always equal in their width, varying a few inches. In the exceptional instance of the obelisk of Biggeg or Crocodilopolis in the Fayoum, called by Mr. W. R. Cooper an obeliscoid monolith in his able book on this subject, the faces are 6 ft. 9 in. broad, the sides only 4 ft. thick. Our London obelisk is at the base 7 ft. 10.3 in. by 7 ft. 8 in.; at the summit, 5 ft. 1.3 in. by 4 ft. 10.25 in.,—an inappreciable difference. The four sides or faces of obelisks were usually square, but occasionally they are convex; a fact proving the nice perception for effect, which prevailed in the minds of the ancient Egyptians, as thus the light was much softer upon the surface, the shades less crude, and the angles less cutting. Whether there is in any an entasis in the upright line has not yet been precisely ascertained, but perhaps this fact may now be set at rest in respect of our Alexandrine obelisk. Usually obelisks had one, two, or three vertical lines of hieroglyphs. Originally it may be assumed that only one central series was contemplated by the original Pharaoh; but it appears that his son, successor, or successors, added a line on each side: and it is remarkable that earlier hieroglyphs were much deeper cut than the more recent ones. Occasionally some of the hieroglyphs have been altered or erased, more or less deeply cut, and the names of other gods or Pharaohs have been substituted, like the inscriptions upon some of the Roman triumphal arches. I just now noticed the mention made by Mariette Bey of the faces of obelisks having been gilt, the hieroglyphs themselves retaining their original colour and actual surface of granite. It is not impossible that occasionally the hollows of the hieroglyphs may have been filled in with some coloured substance, in like manner as we see on the frescoes the hieroglyphs painted in different colours, like those preserved in the Egyptian Hall of the British Museum. These inscriptions are generally trivial and meaningless, recording little more than the names and patronymics of the king, his relationship to the gods, and list of his virtues and of the peoples he may have subdued in battle; sometimes with maxims and blessings of the

gods. One of the inscriptions on the obelisk of S. John the Lateran, Rome, is rendered in Dr. Birch's "Records of the Past," vol. IV., p. 8 :—

"The Har-em-akhu, the living Sun—the strong bull crowned in Thebes—lord of diadems augmenting his kingdom—the hawk of gold—the arranger of diadems—very valiant, the King Ra-men-Kheper—approved of the Sun, son of the Sun,—Thothmes (III.) has made this memorial to his father Amen-Ra—lord of the seat of the upper and lower countries—has erected an obelisk to him, at the gateway of the Temple in Thebes."

The obelisk of Alexandria, now lying in our Thames, contains similar inscriptions; but I have preferred giving this from the Lateran monument, as it refers more directly to the obelisk erected by the king, Thothmes III., and to the Temple at Thebes before which it stood.

We have now to consider the dies, pedestals and steps upon which the obelisks were anciently raised. On this subject we have very little reliable information, for the bottom portion of those now left standing in Egypt are encumbered and surrounded by huge fallen blocks of stone, preventing their full size from being ascertained; and on those transported to Constantinople or Rome or elsewhere from their original sites no reliance can be placed. Our late friend, Mr. Joseph Bonomi, may be considered a great veteran authority on the subject of obelisks, as he made it an especial object of study when in Egypt and in Rome; and there is a very complete enumeration and analysis of existing monoliths by him in vol. I. of the Second Series of the Transactions of the Royal Society of Literature, 1843, and a description of the Alnwick Obelisk, p. 170 of the same volume. To his liberality we owe the two fine models, now on the table, of obelisks at Karnak and Luxor. In a private letter to myself he says, that he had seen the upper part of the block of granite on which that of Karnak stands—it is cubical; on two sides the surface is vertical, on the two other sides the surface inclines very much, but the exact angle I do not know, nor do I know how high the block is, for the lower part is encumbered by large masses of stone! The model was made for the late Duke of Northumberland (Algernon Percy). This divergence of the faces of the die is a remarkable confirmation of my previous remark as to the irregularities existing in large blocks of granite, from the desire of the Egyptians to retain, as far as possible, the cubical mass entire. Mr. Bonomi concludes his note by stating, that he had measured and drawn the base of the obelisk at Luxor; that it was composed of several pieces of granite, and on the north and south sides had four statues of monkeys cut out of two or three blocks of granite *in alto relievo*. On the east and west sides are sculptured in Egyptian *Cavo relievo* (hieroglyphs) figures of Nilus bringing in the productions of the country." This extraordinary mode of embellishing the pedestals of obelisks seems almost incredible, were it not for this instance, which is illustrated and detailed by M. Le Bas the engineer, who transported the Luxor obelisk to Paris, where, however the original pedestal forms no part of its present composition in the Place de la Concorde.

This obelisk, as described by M. Le Bas, deserves our special notice, on account of its individual peculiarities.

Ramses II., whose reign began 1388 B.C., extracted the monoliths from the quarries of Syene, and transported them to Thebes, and partly incised the hieroglyphs of the middle column. His brother and successor, Sesostris, whose reign began 1328 B.C., completed the inscriptions. It thus appears that the hieroglyphs were executed before the erection: for Ramses II. set up the obelisks 1388 B.C., and had his name engraved on the base as an historical record. The total height of the shaft is 75 feet at its base, 8 feet wide, at the top an average of 5 feet. In its elevation the opposite faces in their height have a different curvature—on the one side being convex and the other concave, to the extent of about a couple of inches, an imperceptible

SOUTH-WEST FACE OF PEDESTAL & PLINTH.

NORTH-WEST FACE OF PEDESTAL & PLINTH.

PEDESTAL OF THE WESTERN OBELISK OF LUXOR, AS GIVEN IN THE WORK OF M.A. LEBAS, C.E.

T.I. Donaldson

Lithog.ª for the R.I.B.A. by C.F. Kell, London

difference from a straight line; but it is remarkable that the two obelisks coincide in this detail. I imagine that the first block must have been irregularly marked out and worked, and the second one compelled to follow the faulty line in the quarry. The pedestal of each obelisk is composed of two distinct parts, its base and its die. The base or plinth resting on the pavement consists of three horizontal blocks of three courses of sandstone—the central die is a granite monolith, supporting the weight of the obelisk—and has on two of its sides four projecting monkeys in high relief; the other sides being plain, with the exception of incised hieroglyphs; one side of the die with four of the monkey figures was a slab-facing of the die, and it consequently did not contribute to its solidity. The entire monument was erected on the grey stone paving, and was sunk into the paving blocks a few inches. Such is the very remarkable construction and decoration of these, I presume, very exceptional instances. As to the pedestals of the obelisks, we may infer that in other cases, the monoliths rested on one or more steps, and that they did not rise at once without any substructure or plinth from the level of the pavement. Sometimes bronze balls or other supports at the angles, raised the monolith, a few inches above the slab or block beneath. Mr. Dixon discovered an inscription engraved in Greek and Latin on the bronze crabs supporting the standing obelisk of Alexandria, having the words "Anno VIII. Cæsaris, Barbarus Præfectus Ægypti posuit; Architectore Pontio" (see E. Wilson's Cleopatra's Needle, p. 11). This explains the reason why some of the obelisks at Rome have the like angular supports.

We will now turn aside from our immediate subject to consider a class of monolithic pillars in Ethopia, erroneously termed obelisks by travellers in that country.

M. De Cosson in his work, entitled "The Cradle of the Blue Nile," 8vo., London, 1877, in his 11 Ch. vol. I., gives an account of his visit to Axum in Abyssinia and the ancient capital of Tigre, supposed to have been formerly the Metropolis of the Troglodyte Ethiopians or Cushites. Bruce said that he saw a stone with an inscription of the Ptolemies on it, but this M. de Cosson did not succeed in finding. In the plain near he saw an obelisk of stone standing upright, near the ruins of the Temple of Axum, the width of which was greater than its depth; there was no carving on any of its sides, but the lines were straight and sharp, as if they had just been cut by the chisel. At Axum are a number of gigantic monoliths of grey granite, which seem to have formed part of some great early Ethiopic temple, of which little or nothing is now known. The great stone near the ruins of the temple is said to be 70 ft. high, its width nearly twice as great as its depth; it has four parallel sides forming four right angles, tapering gradually towards the top, and finally ending in a pointed ornament somewhat resembling an ace of spades. The front or smoothed side is carved with a regular pattern, dividing it into little panels, and near the base is the carved representation of a locked door of ordinary dimensions. The lock carved is exactly the same as the wooden locks still used in Egypt and Palestine, but which are never seen in Abyssinia. In front of this door is a great square block of granite placed against the base of the stone, and having four little hollows scooped in the upper side about the size and depth of a finger bowl. The surface of this block is quite smooth and has a scroll pattern carved round the edge, but the underpart is rough and irregular in shape. Probably, says our author, it was used as an altar, and the blood of the sacrifices was collected in the little basins described.

These pillars, so essentially different from the obelisks of Egypt, must only be considered of the same class as the Stele of the Greek, and of no more affinity with the Pharaonic monoliths, than the pillars round the temples in Ceylon.

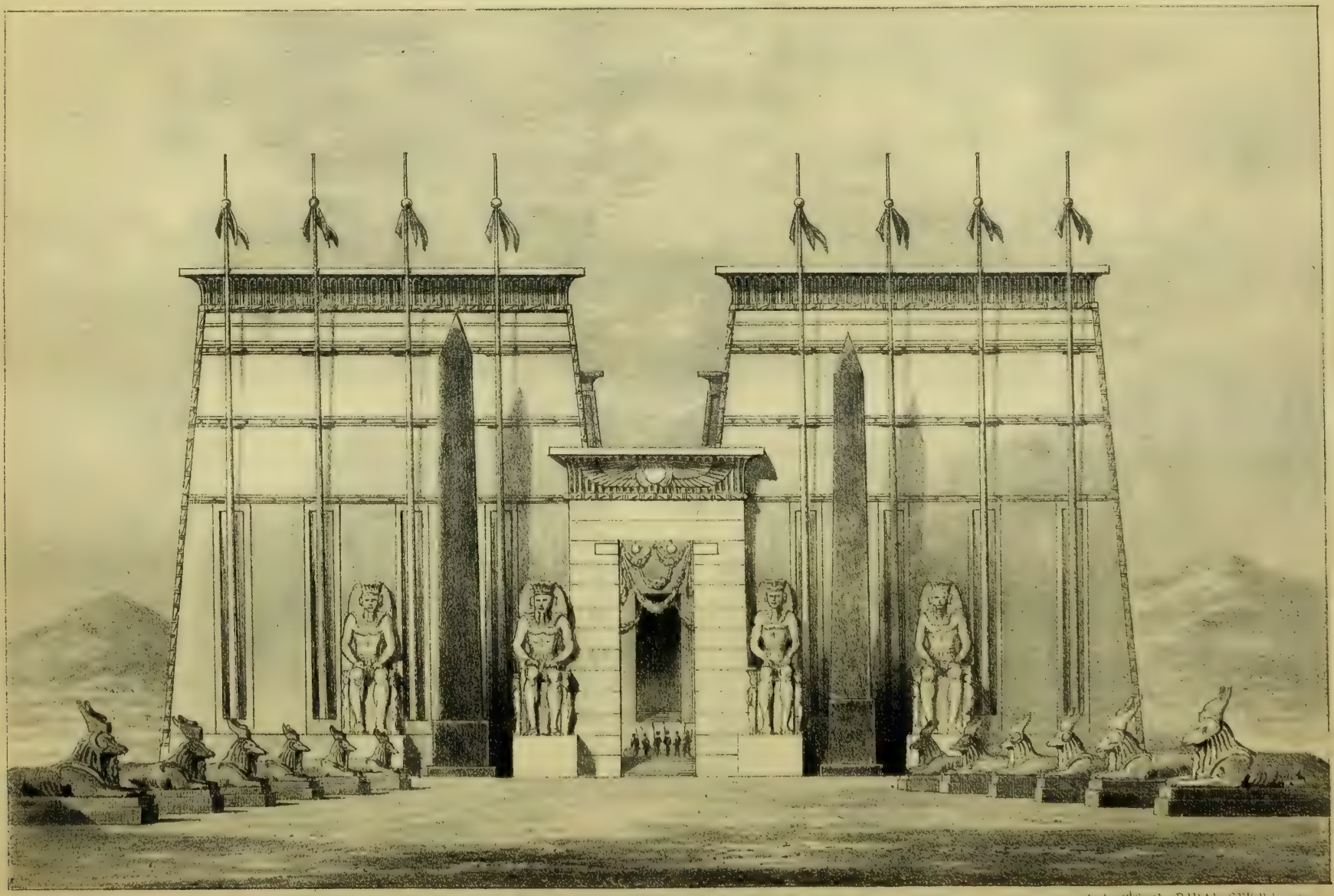
The erections on the banks of the Nile were constructed of the sand and limestones extracted from the quarries near. The pink granite was only used for the obelisks, statues, sarcophagi, casings

of the pyramids, sanctuaries in temples and linings of some special tombs, and for other precious or sacred purposes. The position of the quarries of Syene must have been of the utmost importance in facilitating the application of that fine material. Situate below the rapids—or, as they are generally called, the cataracts—when once the masses were extracted from their beds, no obstruction presented itself in their course down the river to their destination, whether to Memphis, Heliopolis, or the Delta. Mr. W. R. Cooper (p. 3) states, that twenty-seven of the forty-two now known were from Syene, and they are doubtless the largest. An unextracted block still remains at Syene, 95 feet long by a diameter of 11 feet, with the quarrymen's marks upon it.

Sir Gardner Wilkinson mentions that the final operation of extraction, when three sides of a mass had been worked round, was by cutting a groove or channel about a couple of inches in depth, and kindling a fire along its whole length. When the stone was intensely heated, cold water was poured into the groove, and the block detached itself with a clear fracture. Wedges of wood were also inserted, saturated with water, then exposed to heat, and the expansion rent the mass asunder. Thus detached it was drawn down to the river, where it was encased, or upon a galley or raft floated down the Nile to near the spot where it was ultimately to be set up. From the river bank it was hauled to the Propyla, in front of which it was to be erected, as shown on the illustration before you, representing in a sculpture on the wall of a hypogee at Beni-hassan the transport of a colossal statue. One at Gournah measured 57 feet 5 inches high, and, according to Mariette, weighed not less than 1,198 tons ! The colossus on the illustration is supposed to be about 20 feet high, and the monolythic block rests on a species of sledge, or cradle, to which it is securely fixed by cables. There are four lines of eighty-six men hauling the load with cables ; the men are in couples. In the front part of the statue, standing at its feet, is a man pouring water upon the ropes to prevent their chafing and catching fire by friction. On the knee is a man with outstretched arms beating time with his hands that the efforts and action of the haulers might be uniform. At top are six companies of soldiers of ten to each company, carrying in one extended hand a palm branch, in the other a club. Beneath the cradle or sledge of the statue are three water carriers with their jugs and three men carrying blocks, and three officers with wands. Behind the statue are three other rows of men—twelve in all—to act as relays. Under the sledge there is no appearance of rollers. We have no hieroglyphs or painting on the walls of the pyla, or tombs, showing how the obelisks were raised and placed in their final position. That the erection of the monolith on its pedestal was a most critical operation is sufficiently obvious, and its difficulty is illustrated by an anecdote related by Pliny : Rameses erected an obelisk 140 cubits high and of prodigious thickness. It is said 120,000 men were employed on the work. To ensure the safety of the operation by the extremest skill of the architect, he had his own son fastened to the summit while it was raised. Our obelisk weighs 187 tons.

But on a small illustration before you there is represented a mural painting in a hypogee, or underground tomb, at Gournah, with three men polishing a column of no great size ; but that may be convential. The column rests on blocks ; the polishers are astride, or seated on the column, with rubbers rubbing the surface: another, from the same tomb, shows a colossal upright figure surrounded by scaffold poles ; five artizans are chiselling, rubbing and polishing the surface. Another small illustration represents a mason carving a many-coloured sphinx ; he is chiselling the paw of the animal ; he has a wooden mallet in his right hand, and in his left a steel chisel, unmistakingly indicated by the deep blue colour of the tool. We know not whether emery or what other powder was used by the polisher.

I have not yet alluded to the masons' and carvers' operations of cutting the hard materials used in their obelisks, statues, sarchophagi, &c., such as the pink and black granite, black marble, basalt,



T. L. Donaldson. del

Lithog^d for the R.I.B.A. by C.F.Kell, London

ELEVATION OF THE PROPYLON OF EGYPTIAN TEMPLE WITH THE SPHINXES, COLOSSAL STATUES, STANDARDS & OBELISKS.

&c. Hardly any iron tools have been preserved among the relics of the tombs. With what materials did the ancient Egyptians carve with such refined delicacy and exquisite sharpness the mouth, eyes, and other features of their statues, or what Mr. Erasmus Wilson calls the gem-like surfaces of the *in cavo relievo* of the hieroglyphs? I do not know that we are possessed of any process, by which brass may be sufficiently hardened for the purpose, and we have not specimens enough, which have survived the oxydation of the iron to satisfy us on the point as to that material. Could they prepare and soften the surface by some chemical application on the harder elements of their hard stones? No one as yet has been able to inform us; but the secret mystery of the execution of the Egyptian sculpture still evades our wonder and admiration of their skill. Our own granite merchants have achieved wonders by means of steam machinery, in working out by rotary motion the shafts and bases and caps of certain columns and circular pedestals; but the refined sharpness of the lips, eyebrows and other delicate features of the Egyptian heads, as they appear even upon the lids of the sarcophagi, or the busts, in the British Museum, has yet to be attained.

I have before observed that the Egyptians were less careful as regards any fixed proportions of their monoliths, but were more anxious to use up the blocks as it came from the quarry, whether as to the height or uniformity of shape. The sides of an obelisk rarely corresponded exactly with the breadth of its face, or the height of the shaft to any fixed relation with the width at the base, and there is a like disregard in the height of the pyramidion, which however was high peaked and never stunted. Nevertheless we may generally assume, that the shaft varied from eight to nine diameters high up to the pyramidion, which itself was from sixty to seventy-five hundreds of the breadth at the base. Too few of the pedestals, plinths or steps have been ascertained or measured to afford any general law of proportion whether as to their breadth or height.

The positions of obelisks were before the gigantic pylons, which formed the entrance gateways to the forecourts of their temples, and they were, I think without exception, always in pairs. At Karnak the situation of the two lofty ones erected by Queen Hatasou (one of which still stands, and is, according to Mariette Bey, p. 370, 108 feet 6 inches high, the loftiest one known) was between two lofty pylons only 40 or 50 feet apart! Those in front of the outer pylon are not so distant in advance of it. Consequently the Egyptians disregarded the immediate proximity of a lofty wall, backing them up, and none are known situate in wide open spaces. I have grouped together in a drawing the various objects, which occupied the approaches to the temples and formed an assemblage, that was calculated to impress with awe the dignity of the fane of their god. The sacred way led up from the river flanked on each side with variously headed sphinxes. At Karnak the dromos is one mile and one-third long, with a line of sphinxes on each side. Approaching nearer, the worshipper finds two obelisks on the right and left not necessarily of the same height. At Luxor one is 7 or 8 feet higher than the other, and to diminish the appearance of disparity in size, the shorter one is raised on a lofty pedestal and brought some feet in advance of its companion. Attached to the face of the pylon are six sedent gigantic statues of kings, majestic as to size and seated in the hieratic posture. Lofty coloured poles, similar to the standards at Venice, are inserted in sinkings chased into the walls surmounted with the expanded banners of the kings or heraldic bearings of the temple floating in the wind. The pylon itself, perhaps 200 feet wide and 100 feet high, forms the back-ground of the whole, crowned by its cavetto cornice and its surface covered with coloured sculptures of the victorious Rameses, in his chariot, with upraised arm slaying his enemies, trampling them under his horses' hoofs, and alone dispersing them in flight! a grand scene of one of the dramas in the reign of a victorious monarch. In the centre of the structure is the portal, 56 feet high, and through it the sacred or triumphal procession passes in all its gorgeous

majesty to within the sacred precincts, there to observe the ritual ceremonials of the mysterious Egyptian cult of one or more of their eight great divinities (see *Birch*, p. x.) or animal gods.

Having thus given a slight sketch of the architectural magnificence of the Egyptians, allow me to offer a tribute of respect to a brother architect, his name, as given by Mariette Bey, is inscribed on the Temple of Edfou. It was Ei-em-hotep Oer-si-Phtah. Imouthes, the great son of Phtah, the only one yet discovered on the monuments of Egypt. I am afraid we are too late for its insertion in the colossal architectural dictionary of our times, unless it finds its way into an appendix.

The chronology of the Bible, as assumed by some learned men, gives the age of the world before the Christian Æra as 4004 years. Mariette Bey (p. 22) *under reservation*, founding the calculations upon dates afforded by inscriptions upon tombs, temples, obelisks and other monuments, gives the date of the Egyptian empire alone and its dynasties as 5004. Bunsen assumes a still remoter period, and my friend Lesueur, our Honorary and Corresponding Member, in his chronologie "Les Rois d'Egypte," commences with 20,000, which latter is to be considered as an imaginary datum, from which to start in computing the history of the world. But adopting Mariette Bey's comparatively moderate number of 5004 for the beginning of the Thinite dynasty, as the historic date of the commencement of Egypt's national existence, it fills one with wonder, when we consider how many gaps occur in the continuous rule of Egypt's autonomy. How could the very existence of her nationality and arts be maintained, even with periods of more or less purity, when we know that for about 1200 years, or nearly one-fourth of her existence, she was at various times ruled and overrun by the hykshos or shepherds, the Ethiopians and the Persians, under Cambyses, Darius, Xerxes. At last she was conquered and ruled for 332 of those years by the Greeks and Romans from the time of Alexander and his successors to that of the Romans. Could any other people under such crushing circumstances have maintained their identity on their own native soil?

I will not further trespass on your time and patience but by one more remark arising out of our subject. I cannot but think that the arrival and erection of the Alexandrine obelisk among us may produce very notable results in regard to our knowledge of ancient Egyptian history and connected as it is with our Bible. The old Greeks and Romans, the classics of our boyhood, have had their annals duly chronicled and reduced to elaborate histories by the learned. These it is true have been turned upside down by recent erudite enquiries, substituting a different and new chronology, and an assumed rational statement of facts. Egypt till very recently had no consecutive accepted history in our language, that I know of, until our learned Dr. Birch of the British Museum, a name honoured and esteemed by all Egyptologists, whether British or Foreign, compiled for the Christian Knowledge Society his summary of the ancient history of Egypt from the monuments (one of a series) putting together with vast knowledge and most critical acumen an admirable history. There cannot be a doubt that our countrymen, as they pass by our obelisk, will have their curiosity excited by the sight of hieroglyphs, which may have been seen and read by the Jews at the time of Moses, or when our Saviour was taken by his parents to Egypt as a place of refuge from Herod's rage. They will seek in Dr. Birch's book the solution of the mysteries revealed in those enigmatical sculptures, and the history of that ancient people.

THOS. L. DONALDSON.

Consult Champollion-Figeac; "L'Egypte ancienne" (l'Univers pittoresque). Sir Gardner Wilkinson's Works. H. Brugsch, "Histoire de l'Egypte." Dr. Birch, "The Monumental History of Egypt." Mariette Bey, "Itineraire de la haute Egypte." W. R. Cooper, "Egyptian Obelisks." And other publications on Egypt bearing the authoritative names of Lepsius, Ch. Lenormant, Chabas, De Saulcy, &c.

OBELISKS.

PRESENT SITE.	SIZE.	HEIGHT.	BY OR TO WHOM DEDICATED.
	ft. in. ft. in.	ft. in. ft. in.	
HELIOPOLIS - - -	6 1 × 6 3	68 2 OR 66 6	VSERTESEN, 2851 B.C.
BIGGEG-CROCODOPOLIS -	6 9 × 4 0	ft. in. 43 0	IDEM.
KARNAK - - - - -	8 $1\frac{1}{2}$	93 6 or 90 6	THOTHMES I.
IDEM - - - - -	MARIETTE	108 10	HATASOV, B.C. 1660.
LATERAN, ROME - -	9 8 × 9 10	105 6	THOTHMES III.
VATICAN, IDEM - - -	8 10	82 9	NO HIEROGLYPHS.
ALEXANDRIA - - -	7 7 × 8 2	70 0	THOTHMES III.
LONDON - - - - -	7 $10\frac{1}{4}$ × 7 8	68 $5\frac{1}{2}$	,,
CONSTANTINOPLE - -	BROKEN	50 0	,,
SION-HOVSE - - -	0 $10\frac{7}{8}$	7 6	,,
THEBAID, ALNWICK -	0 $9\frac{3}{4}$ × 0 9	7 3	AMENOTEP II.
PORTA DEL POPOLO, ROME	8 5 × 8 5	78 6	SETI MENEPTHAH I.
TRINITÀ DEI MONTI, IDEM	4 3	43 6	,,
LVXOR - - - - -	- -	82 0	RAMESES II.
PARIS - - - - - -	8 0 × 8 0	76 4	,,
SAN, OR TANIS - - -	- -	- -	,,
MONTE-CITORIO, ROME -	- -	71 5	SESOSTRIS.
PIAZZA NAVONA, IDEM -	4 5	54 3	
PANTHEON, IDEM - -	FRAGMENT	50 0	,,
VILLA MATTEI, IDEM -	8 3		
PIAZZA MINERVA, IDEM -	FRAGMENT	17 0	
BRITISH MVSEVM, 2 -	1 6 × 1 5	8 2	AMYRTÆVS I.
CONSTANTINOPLE - -	6 0 × 6 0	35 0	NECTANCHO I.
CORFE CASTLE, PHILÆ -	2 2	22 $1\frac{1}{2}$	PTOLEMY EVERGETES II., [150 B.C.
BENEVENTO - - -	- -	9 0	
MONTE PINCIO, ROME -	- -	30 0	HADRIANVS.

Erasmus Wilson (page 178), enumerates the existing Obelisks, as follow:—Rome, 12; Italy, in addition, 1: Egypt, 6; Constantinople, 2; France, 2; England, 6; Germany, 1.

The PRESIDENT.—Our friend, Professor Donaldson, has started a number of questions, ideas, and suggestions in his Paper, more or less recondite and interesting. I trust he will be present at the next Meeting to assist in their elucidation. I hope also to see Mr. Dixon then, as well as many others, and I am quite sure we shall be interested to hear what is the proposed mode of raising our own obelisk into its position, as compared with those modes, more or less known, of raising other obelisks in Rome and Paris.

Mr. JOHN DIXON, C.E., Visitor.—I would say, with a view to the Discussion, I should be glad if so distinguished a body as the Institute of British Architects, would come prepared on the next occasion, to discuss rather more in detail than Professor Donaldson has been able to do in the short length of his Paper, the forms of pedestal and base, designed for the Cleopatra obelisk and others which we know of—the ancient Egyptian bases and those illustrated by the series of drawings which accompany the Paper,—because that, in an architectural point of view, must be one of the most interesting subjects to which such a body as this can direct their attention. I shall be happy to afford every information I can, and I hope you will be good enough to give those who are at work on the London Obelisk some hints and ideas with reference to the subject. I propose to bring here either drawings or a model—or perhaps both—of the base which, after mature consideration, has been determined upon.

A vote of thanks to the Professor, proposed by Mr. Charles Fowler, and seconded by Mr. Octavius Hansard, was passed by acclamation.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday Evening, April 15th, 1878, CHARLES BARRY, F.S.A., President, in the Chair, the following business took place :—

DISCUSSION ON PROFESSOR DONALDSON'S PAPER—OBELISKS.

The PRESIDENT.—We are about to enter upon the Discussion of the interesting Paper contributed by Professor Donaldson. Unfortunately the irregularity of our Meetings of late has prevented the Paper being in the hands of all the members previous to its discussion ; but through the instrumentality of the Press even those not present last Monday evening are acquainted with the interesting questions which the Professor raised ; they have come here to-night, I have little doubt, fully prepared to satisfy him by showing the attention they have paid to his Paper. Mr. Dixon is here, and judging by his surroundings,* is prepared to rush at once *in medias res*, and with his usual courtesy he has invited the suggestions and advice of architects as to the character of the pedestal suitable for the obelisk he is about to erect in our midst. He is going to describe, as he puts it, the "accepted" pedestal of the obelisk. That will not leave us so much room for discussion and advice as might have been desired ; but he will no doubt show, whatever our advice and whatever our opinions may be, that the accepted pedestal is far better than anything we could have suggested.

Professor DONALDSON.—My friend Mr. Dixon has asked me to say two or three words by way of introducing this subject. The truth is, with respect to the pedestals of obelisks, that we have very little authentic information. I read a letter from the late Mr. Bonomi at the last Meeting explaining his models of various obelisks. We have them now before us—of Karnak and Luxor—and the truth is that all the pedestals of the obelisks still standing, and of those obelisks which have disappeared, are so encumbered with vast blocks of stone and granite that it has been impossible to ascertain the precise form or height or dimensions of the pedestals of the obelisks.

Mr. Bonomi has given us some information of this one at Karnak, but though it was so encumbered in the back part that he could only go to a small depth, still he ascertained that on two sides the surface was vertical, and on the other sides the surfaces inclined very rapidly, as shown on the model, which is valuable because it contains not only the obelisk and pedestal, as far as he knew it, but the hieroglyphics inscribed upon the monolith. Mr. Bonomi merely saw the upper part of the pedestal, but whether there were steps beyond the plinth on which the block rested he could not ascertain.

Another example of the pedestal of an obelisk is that of the obelisk of Luxor, which was removed by the French engineer, M. Le Bas, to its present position in the Place de la Concorde, and in his work he gives the elevation with the details which will appear in illustration of my Paper. It is very curious. There is a pedestal and plinth of courses of stone, the main pedestal being of

* A model of the London obelisk, as it will appear when raised upon its pedestal at the Adelphi Stairs of the Victoria Embankment, was lent for the Discussion by Mr. Dixon ; and to this the President referred.

granite and on two of the faces there were images of monkeys, which are most unusual objects for the ancient Egyptians to place upon such monuments, because the obelisks themselves were objects of worship by the Egyptians, as pointed out by Dr. Birch in his work. It is curious, and I therefore thought it worth while, with the approval of the Council, that this should form one of the illustrations of my Paper. This is the only evidence we have of what the ancient Egyptians did with regard to the pedestals of the obelisks.

With respect to the pedestals of the Roman obelisks I did not offer an opinion. I treated the subject as left to us by the ancient Egyptians in the monuments themselves. I refrained from entering into that wide subject which would detract from the classical treatment of the obelisks themselves. We see the wide range of obelisks that are exhibited here; and if I allude particularly to that which has been erected in Paris, it is because one can hardly imagine that the French should have had a pedestal of that proportion placed under an obelisk of that height and width. It seems quite apart and distinct from the feeling of antiquity. I understand from my friend Dr. Birch, there exists in the museum of the Louvre the very pedestal which was brought over by M. Le Bas, the Engineer, but it has scarcely been seen by anyone. No doubt it was thought that it would excite the epigrammatic caustic wit of the Parisians if they erected the obelisk on the pedestal as it was at Luxor. With respect to the other obelisks, they are treated with a Roman feeling, quite distinct from the horizontal lines of the mouldings being inconsistent with the vertical character of the monolith. Here we see an obelisk, that of the Piazza Navona, Rome, raised upon a rock, the work of Bernini; and when the Pope paid a visit to that architect he invited his Holiness to see this obelisk. He went and was much delighted with it, and spent some time in examining the figures which have been introduced by Bernini at the base of the pedestal—consisting of fishes and shells and other marine objects; just as his Holiness was going away, on a signal from Bernini, the water gushed forth and showed the fountain which formed the base of the obelisk. On that occasion, it is stated, the Pope was taken so much by surprise that he exclaimed, "My dear Bernini, you have given me two years of existence by this grand surprise." We have also a drawing of the obelisk of the Vatican, and you see how it is raised pile upon pile. This spoiled the original proportion of the obelisk and introduced another sentiment of relative proportion. But to show you the feeling of the Romans with respect to obelisks, I would point out that of the Piazza Minerva at Rome, in which more emphasis and expression was supposed to be given to the base by putting the obelisk on the back of an elephant! This was a topic into which, as I have said, I did not enter. I thought it more appropriate to the Institute to show only what the Egyptians have done with respect to their obelisks; and confine myself to their classical features, their proportions, the materials of which they are composed, the sites they occupy, and the purposes for which they were erected.

Mr. JOHN DIXON, C.E., Visitor.—After the kindly remarks of my friend Professor Donaldson, and what has fallen from the President, I may say it was my especial desire some months ago, if possible, to have had this subject brought before the Institute of Architects—at a time when their advice might have been given before the decision with regard to the pedestal, &c., was finally arrived at, instead of after that decision had been come to. I was particularly anxious, and I wrote to my friend Professor Donaldson expressing my desire that the subject should be discussed, because I felt that a body of professional Architects would have been able to have given some advice which I have not the slightest doubt would have been highly beneficial. In the first place we had to consider—and I beg you also to consider—that in bringing this obelisk to England we have simply preserved from decay and destruction an interesting old monument; and having got it here, we desire to set up that monument on a plain and suitable pedestal adapted to the purpose with no ornate pretensions. We do not

desire to create a national monument; all we desire is somewhat as though a man had got an ancient and interesting picture and wanted a frame in which to hang it in his room—to show it off reasonably and fairly to the best advantage—without contemplating anything to the extent of building a new house and premises in which to exhibit the treasure.

I make this remark in reference to the many suggestions which have been made of more or less ornate productions and designs, of which the obelisk itself was to form a mere part in the general structure. With this view we have proceeded. In the first place let me direct your attention to the obelisks already erected, and of which Professor Donaldson has given us so interesting an account. Now, all of us must have seen an immense lot of matter written in the newspapers explaining (as the writers imagine) the ideas of the ancient Egyptians. All I can say is, from my humble knowledge of the works they have left—from which alone we can form impressions of their ideas—those ideas were very mixed, and, as Professor Donaldson has shown us, were exhibited at times by very incongruous and extraordinary results. All the obelisks of Egypt that are known to us had a base of some sort or other. At the present day the ground has risen up around them, by which the bases are obscured; and the general nature of the country is so altered that we can form no opinion as to the surroundings at the time of the erection of the obelisks. We have here a model of the ancient obelisk of Karnak. You will observe that the block which stands above the surface of the ground is somewhat tapered, whereas, in the case of another you see here, the sides of the block are made parallel. [Professor DONALDSON.—That is at Heliopolis.] At the present day, the pedestal is two feet below the surface of the ground. It rises in the middle of a vast plain. It was not so originally. The base of that obelisk has been excavated, and this was the result [*pointing to drawing*]. It was found that this was the foundation on which it stood. Now, if you refer to another drawing—that of the obelisk we have recently brought home—it had a base of which this is a representation. You will see that that base is practically the same as that of the existing great obelisk at Heliopolis; and I have no doubt myself, from the appearance of the bases and of the granite, that those bases were brought from Heliopolis at the same time the obelisks themselves were removed. The distinctive feature of all those three pedestals is that the die-blocks have parallel sides.

Now, the question whether the form of pedestal is suitable or not must, in a great measure, under the circumstances, be determined by the surroundings; and no doubt when the Romans removed these obelisks to Alexandria, they adapted the temples and surroundings to the objects they were about to place at the water-gate: but when we come to England we are met with different climate, different surroundings, and a different state of existence. We have to make the best of the circumstances under which we are placed; and in considering the various sites that were suggested, we had to consider not only the surroundings, but the means of access to them. The remarks I have made as to a suitable pedestal for the monument will also apply to the selection of the site. As I have already said, we do not propose to erect a national monument; but we have to be guided by other and reasonable circumstances, and especially by the inexorable consideration of finance. The cost of moving our monolith through the streets of London would necessarily be very great. It is no use saying what could or could not be done. Archimedes told us he could move the world if he had the means; and I have no doubt our engineers and architects could do the same. On this question of site, I may express my opinion that undoubtedly the finest site in London would be opposite St. Paul's, at the top of Ludgate Hill; but how are you to get it there without stopping some of the leading thoroughfares for a time, which would create a large amount of public indignation on the part of those interested. Then we had to consider the question of outline and skyline, and

all the other lines upon which a good deal of sense and a considerable amount of nonsense has been talked and written. If you were to set the obelisk in the centre of Salisbury Plain, it is true it would be seen very distinctly; but you would have nothing alongside by which to judge of its comparative size, and without that the obelisk itself would appear very insignificant—large as a monolith, but small in comparison to a building. The ancient Egyptians always erected their obelisks opposite their temples, and they generally stood at the Pylon, invariably in pairs. There you had a building beyond to set it off—a building the size of which you could estimate and can judge of; and, as it seems to me, it is very desirable, in setting up a great monolith, that you should have something in juxtaposition to it, by which the mind can realise its proportions.

In finally selecting the site we were guided very much by these and other circumstances I need not dwell upon. But having fixed the site, we then had to determine upon the best form of pedestal that could be adapted for the purpose, that should be in accord with the surrounding architecture, present no incongruous characteristics and no harsh lines to mar the feeling of symmetry and stability.

We found that at the Adelphi steps by the river side, of which this is a model, there were two pedestal blocks already there, and these the Metropolitan Board of Works undertook to alter. We had numerous models of pedestals prepared, some too high and some too low; and I may say it never entered our minds to copy any of the examples—the monstrous examples, I think,—which other European nations have adopted for the bases on which they have placed their obelisks. It does appear to me, and I think no one will dispute it, where you have a shaft erected of this form, the eye does expect to see a line carried down to the ground without incongruous angles. Where is there a structure which conveys a greater idea of strength and harmony than the Eddystone Lighthouse? It appears the very embodiment of solidity. There is no point at which it could be struck which is weaker than the rest. Which of these foreign obelisks presents that feature? Take the last that has been erected—the French one. I do not think any one will be found to advocate that as a suitable and an artistic design for the base of our obelisk, but the fine site on which it is placed covers a multitude of sins. The Roman pedestals are better; but those who have had to do with the question here do not accord with putting Roman capitals round the top of the pedestal under our ancient monolith.

Professor Donaldson, when the first model was erected here, pronounced it to be an exact reproduction of the Heliopolis base; and whatever its merits might have been in the site on which it then stood, it was inappropriate to the site proposed on St. Stephen's Green. Professor Donaldson suggested the tapering base, and I must say without exception that has met with the general approval of most of those who have seen it. I may mention that the distinguished architect whose remains have so recently been laid in the Abbey, the surroundings of which he did so much to embellish, gave his cordial approval. Other eminent men have approved of the tapering form of the pedestal; they have also disapproved of the placing of any capital round the block. All things taken together, all I can say is, that whilst we have considered all the suggestions that have been made, the result of those suggestions is the pedestal we now propose to erect. So far as we yet know, it seems the best that we can devise. If anyone can offer a suggestion for improvement in any material way I do not think it is yet too late for it to be adopted.

The Paper is one about which much might be said on many other matters than those I have noticed, but with the short time that remains for discussion I can only thank you for the kind and attentive way in which you have listened to my remarks.

Mr. H. Heathcote Statham, Fellow.—Will Mr. Dixon be good enough to tell us whether the base of the obelisk is in such a condition as to render it stable when set up? The base is broken: what is the obelisk to stand upon?

Mr. Dixon.—The base is the same as it has stood upon for about 2000 years, and will, so it is calculated, be sufficient to withstand a wind pressure of 95 lbs. to the square foot of surface; and as we seldom get one-fourth of that pressure in this country, it is safe enough. The simplest plan, perhaps, would be to cut that damaged piece of the base off.—[Professor Donaldson: No, No.]—But Dr. Birch and Professor Donaldson would be down upon us if we attempted to do anything of the sort, therefore, what we have proposed to do is not to attempt any artistic development or alteration, but to put it up with the base as it is; and when it is up and you can judge of its appearance, it may be determined whether some little bronze corner plates, to carry the eye down without that sudden break, can be applied with advantage.

Professor Donaldson.—I suppose there is one thing which we all have in mind—which is that we hope the Board of Works will be pleased to do away with those blocks* standing in front of the site of the obelisk; as otherwise the view of the base of the obelisk would not be free, and they would much interfere with the effect of it when placed in position. It is I think desirable that some expression should be given on the part of those agreeing with him in this matter to fortify our friend Mr. Dixon in having those objectionable pieces removed.

Mr. Edward Hall, F.S.A., Visitor.—Will Mr. Dixon inform us whether the foundation wall of the embankment has been proved to be sufficient to carry the weight of this obelisk? According to what I recollect, there are just about that point some rather elaborate underground works in connection with the sewerage arrangements, &c. Will the obelisk rest upon a solid foundation or on iron girders as proposed in the case of the Parliament Square site?

Professor Donaldson.—This is a question which does not affect the matter under discussion. It must be assumed that Mr. Dixon, as an engineer, has sufficient skill and science to enable him to secure a good foundation, and we may trust to him for that. As a matter of fact, I believe the bed of the river, where the obelisk will stand, is solid gravel, as was discovered by Brunel in sinking the foundation for the piers of the Hungerford Suspension Bridge.

Mr. Ewan Christian, Fellow.—Sir Joseph Bazalgette has, I understand, expressed his entire approval of what is being done with regard to the foundation of the obelisk.

Mr. David Brandon, F.S.A., Fellow, expressed a strong objection to the small granite blocks, condemned by the Professor, remaining in front of the obelisk. On the suggestion of Mr. Wyatt Papworth the effect of lowering the base of the sphinxes, and of raising the steps of the pedestal, was shown on the model. Some members intimated their approval of the alteration.

Professor Donaldson.—I understand that what is wanted is that the pedestal should be raised out of the hollow formed by these blocks, that is to say, lifted bodily up.

Mr. Arthur Cates, Fellow.—With regard to the sphinxes, they look very nice from here, as arranged to face the river; but I have a strong impression that the bulk of people who go to look at the obelisk will approach it from the land side, and thus it would be more courteous on the part of the sphinxes to face the visitors. As opinions appear to differ very greatly as to the exact height of the pedestal, I may say that the insertion of the slip of wood in the model, suggested by Mr. Papworth, apparently produced all the effect desired, and made it almost perfect; no doubt with regard to the pedestal, what Mr. Dixon has done in arranging the model will be a vast

* Mr. Dixon and the Professor referred to the small blocks of granite upon the outer parapet of the river steps.

improvement to it. There is, however, one point with regard to the pedestal which requires consideration—that is as to the effect of the projections on each side of the model, to my mind tending to interfere with the continuity of line which is essential, and which appears to be the principle on which the pedestal is designed. Amongst the drawings on the wall, there are two which have been sent by Mr. Thomson, of Devonshire Street, Portland Place, which bear in an indirect way upon the subject; but he is too late. He says, in a memorandum * I have here, but which is too long to read to night—and I will hand it to the Secretary—he contemplates the possibility of some future patriotic individual presenting to the nation a similar monument to this, and he proposes a site for it where it could be seen from a distance, and yet be capable of being approximately approached.

Mr. KIDNER, Fellow.—The question having been raised as to which way the sphinxes should face I would suggest whether they could not be made to face the obelisk itself. That I believe is the position in which the ancient Egyptians would have placed them, although of course the change would involve some alteration of the base.

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* The following is an extract from the Memorandum to which Mr. Cates alluded. It is called

AN EASTERN MONOLITH ADAPTED TO A METROPOLITAN SITE.—The object in view has been to establish the fact that a certain spot in the Metropolis is specially eligible for the erection of a fine obelisk, so that should any future patriotic individual be disposed to present to the nation a similar Eastern Monolith, such as Mr. Erasmus Wilson has nobly done, there should be no delay or difficulty in finding a suitable site for it.

I started with the following three conditions, as of primary importance, to be observed for the due estimate of the Monolith, viz.:—

1st. That the obelisk should be able to be seen for a considerable distance and yet be capable of being approximately approached.

2nd. That it should be placed in a large circle, and in the immediate neighbourhood of architectural characteristics.

3rd. That its locality should be near to public thoroughfares, and yet not likely to obstruct the highway of a bustling city.

I have taken some pains to prove that either Park Square, in the Regent's Park, or a few yards to the north of it, presents such a site, and those who are intimately acquainted with that neighbourhood will be able to confirm that impression. It comprises a vista of more than one mile in length—extending from the Langham Hotel on the south to the end of the Avenue towards Primrose Hill on the north, and whence on the brow of the hill (near the fountain) may be now viewed the tower of the hotel.

The Ordnance Map shows that the centre of Park Square is ninety feet above Thames level, and the buildings in its immediate vicinity are of uniform architectural elevation, whilst others now in progress are of a bolder type, rivalling those in Belgravia.

Having completed my plan, I felt it encouraging to add to it an elevation, as it would appear in one direction, and preferred to confine myself to a simple Indian ink drawing, such as I now submit for inspection.

The subject naturally brought to my mind the well known obelisks which I had seen and drawn at Rome some forty years ago. I mean the one in front of St. Peter's and the other on the Quirinal Hill, which, as regards the treatment of their pedestals, are so totally although successfully different. In the former the pedestal upon which the monolith is fixed is studiously contrived so to unite the two parts of the structure as to secure a kind of entasis in their united outline; while in the latter the pedestal starts from so wide a base, and is so graduated in the successive stages, that the obelisk forms a kind of "spire growth" in its upward course.

In my own humble effort to provide for the due importance to be given the "Eastern antiquity," I have, while preserving the full size of the base of the monolith (whatever it may be), suggested the "canting" off the corners of the die so that each face of it would be somewhat less in breadth than the base of the obelisk itself; and instead of applying Italian or modern mouldings to the top of the pedestal have indicated a curve projection analogous to the cornices of the Pylon as in better "keeping."

Lastly, the suggested bronze models of Assyrian Bulls are mainly excusable, as in harmony with antiquarian objects—both of ancient date.

JAMES THOMSON.

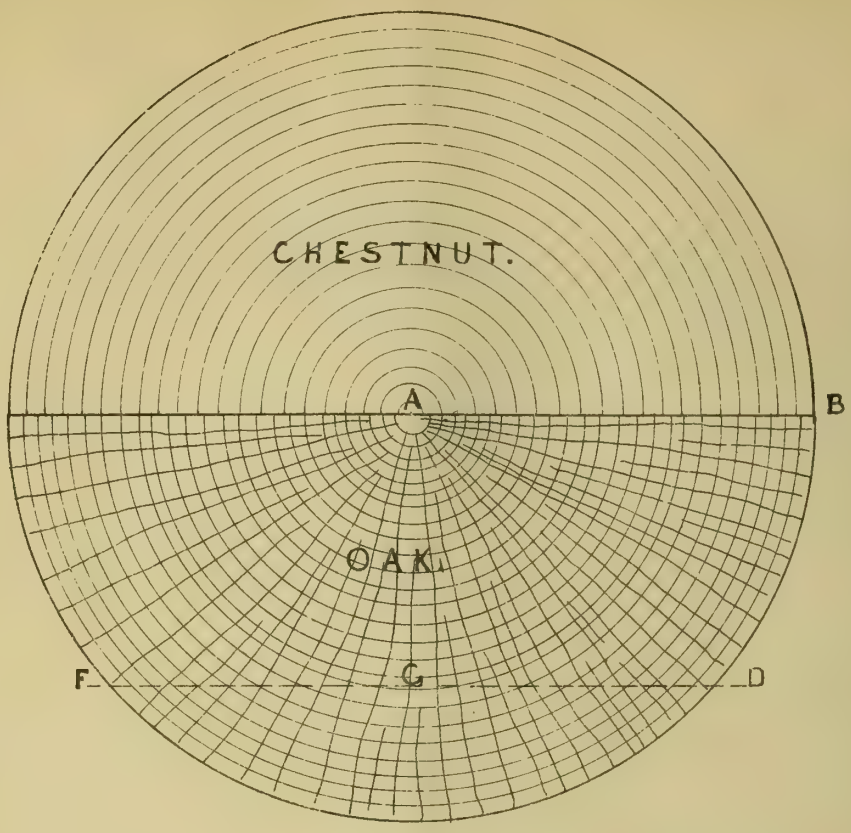
[Drawings illustrative of Mr. Thomson's ideas were exhibited upon the walls of the Meeting room.]

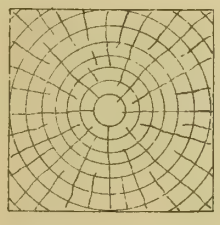
The PRESIDENT.—Time warns us that this Discussion must be brought to a close, and I will detain you only a very few moments. In the first place, I have to propose a vote of thanks to Mr. Dixon for coming amongst us to-night and affording us so much information with respect to this ancient monolith which has been brought into our midst. He has to be congratulated upon having overcome the many difficulties which have attended its transport to this country, and amongst others that arising from the enormous amount of volunteered suggestions on matters of taste with which his operations have been attended. I am not sure he would not be pleased to pay a large salvage to have been clear of the enormous amount of advice asked, and not asked for, which he has received. I have myself been one of the offenders in that way, but I have always learnt that it is desirable to bow to an accomplished fact, and I was very glad to learn that Parliament Square was not an accomplished fact as regards being the site for the obelisk, and that being so I feel comparatively happy as to where it is to be placed. I cannot however think the site chosen is quite satisfactory. I fear myself there is a certain amount of cramping between the footway and the river which will somewhat detract from the dignity with which the monument might otherwise be invested. But that is an accomplished fact; we are rather met to debate upon the proposed plan of the pedestal of the obelisk, and Mr. Dixon has told us it is not entirely too late to make some slight alterations subordinate to the general principles decided upon. He has also told us it was not the idea of Mr. Wilson, any more than it is his own, that the obelisk should be transformed into a London monument, but that they should offer it as an antiquity brought from Egypt here. I think the whole scope of the observations as to the pedestal and its surroundings—and followed up by every speaker—shows that it is likely to be regarded as a London monument. I fully endorse the wisdom of making the pedestal as simple as may be, and the good advice of Professor Donaldson that the pedestal block should be tapered. It would thereby become more graceful. At the same time let us not blame wise men in other parts of Europe who have treated these monuments under different circumstances, and have adopted a certain amount of simple ornamentation which I am not inclined to find fault with. I concur entirely with the propriety of removing the granite blocks from the outer parapet of the Embankment wall, and our opinions may strengthen Mr. Dixon's hands in his endeavours to get those blocks removed. I agree also with the change which has just been suggested and tried in the model: by raising up the base to coincide with the top of the granite blocks on which the sphinxes are placed. With respect to the sphinxes themselves I would venture to hope that a great deal of consideration will be given before they are put there at all. I should like to see the obelisk in its place before they are even thought of. If this ancient obelisk could be flanked by ancient sphinxes as old as itself, I should say put them there; but I am a little inclined to doubt whether, with the extreme simplicity of idea which led to the origin of these monuments, a modern sphinx, or modern sculpture of any kind, is appropriate. I therefore should not like it to be taken as a foregone conclusion that the sphinxes are to be placed there, whether they are to face the road or the river. One idea of a general kind has occurred to me. I have noticed those Adelphi Steps long before the obelisk was thought of, and I have wished that the outside parapet of the steps had followed the rake of the steps. At present it only serves to collect the slime and filth of the river to a disagreeable extent, and I think from the river side the obelisk would gain in dignity if the parapet were made to follow the rake of the line of the steps. One speaker has alluded to other sites, but that question is now settled. I have myself thought of a site more suitable—in fact I think two sites might have been found more suitable than this. I am glad and thankful to see the obelisk here in London, and I congratulate Mr. Dixon on my own part and on the part of the Institute for the indefatigable perseverance which, through good report and evil

report, and through difficulties of all kinds, has enabled him to succeed in his undertaking. I was very sorry to see it stated that he anticipates being a large pecuniary loser by the operation even before it is completed. But let us hope that his increasing reputation and the success of this enterprise will bring their own reward in some other way. At any rate his name will be indelibly associated with that of Erasmus Wilson in connection with the acquisition by this country of an interesting monument of antiquity.

A vote of thanks was then tendered to Mr. Dixon, who, in consequence of the late hour and the Paper about to be read by Mr. Thomas Blashill, Fellow, was precluded from making any reply.

The Paper will be found on the following page.





Beam or Rafter
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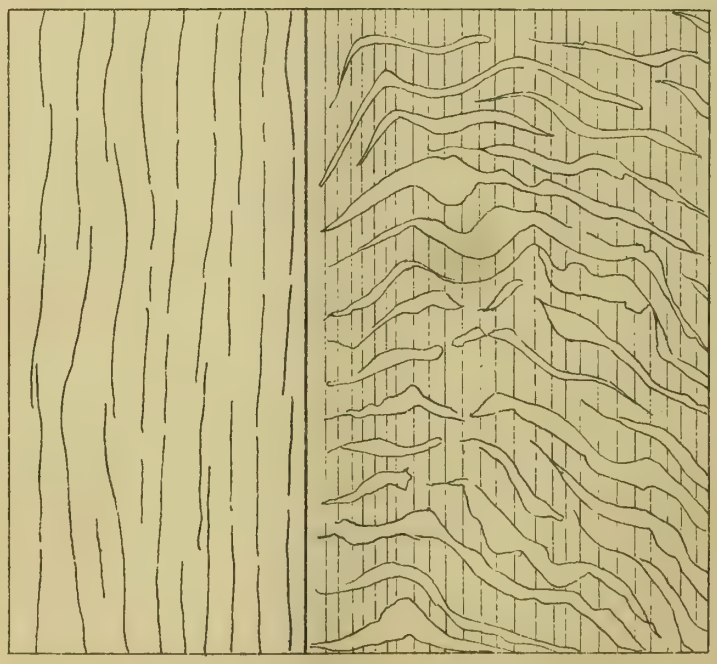

OAK.

cut F to C.
shewing cross sections of
the Medullary plates.

cut A to B.
Seems to expose the Medullary plates
and form the "Silver grain"

Oak "Quartered"
to shew the Silver grain
in Floorboards or panels.

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THE QUESTION OF OAK OR CHESTNUT IN OLD TIMBER ROOFS.

TWENTY years ago a Paper on "The Assumed Use of Chestnut Timber in the Carpentry of Old Buildings," was read before the Institute by Mr. Wyatt Papworth, whose careful research had brought him to the conclusion that the assumpton was unfounded. It was an idea that had become very prevalent during the sixteenth and seventeenth centuries. Evelyn believed in it, stating that the wood was much sought after by carpenters and joiners; and Wren's statement that it had been used in Westminster Hall, the Abbey and other buildings, is well known. The theory was that the timber had been obtained from Normandy, though that province lies north of the chestnut producing districts of France. About a century since, the Hon. Daines Barrington questioned the truth of these stories, and received answers in which quotations and rumours were made to do the work of proofs. Indeed the idea so grew on the public mind that by-and-by the Society of Arts offered premiums to encourage the planting of chestnut trees as tending to uphold the naval supremacy of this country. The repeated contradictions which have since then been given to stories about chestnut roofs have met with no better reception, for at the present time perhaps a majority of builders and workmen and even many architects of experience believe in them. An excellent Paper in our Transactions for this Session (page 74) records the conviction of the author that the greater part of the roof-timbers of St. Alban's Abbey is of chestnut, particularly as "the ancient forests of Hertfordshire abounded in chestnut trees." In the Museum at Kew Gardens there has long been exhibited a piece of the most palpable oak (which by the courtesy of Sir Joseph Hooker I hope to show you) labelled as "Spanish Chestnut from an old beam in Windsor Castle." Finally (which gives the matter its importance for us) the trees planted so patriotically seventy years ago are now mature, and their timber is being sold as oak, or at least as equal to oak; it has indeed actually been used, and has failed, in positions where only oak could have been expected to stand.

If the idea is, as I am forced to believe, a delusion in support of which "the ancient forests of chestnut trees" have been evolved out of slender materials, it is a very singular one; particularly as it has been long abandoned by men of science and has been often exposed in scientific books, while it is now held by persons who are not merely theoretically but practically connected with carpentry. It is curious also that, while Wren and Evelyn thought chestnut to be perishable, the popular belief now makes it quite equal, or even superior, to oak. Hardly an important mediæval building exists in this country the roof of which has not been confidently stated to be chestnut, and the same statements have been circulated in France with respect to their finest cathedrals. In Normandy, where no old groves of chestnut exist, the belief is that their roofs came from England. A sufficient collection of these various rumours may be found in Mr. Papworth's Paper. I shall therefore only say that after many years search I have never been able to find the least foundation for any of them, while such as it was possible to investigate have been proved to be untrue.

In order that we may have a clear idea of what chestnut timber really is, I have collected specimens sufficient to show its characteristic marks, as well as specimens of oak timber from ancient and modern work. I venture to suggest that neither the existence of chestnut forests in this country, nor the use of chestnut timber in the place of oak, ought to be admitted, unless they can be proved by the clearest evidence; and I think that no one ought to make assertions as to the old

chestnut roofs which he has seen unless he has taken pains to make himself acquainted with the wood of the chestnut tree as it is now felled and brought to market.

The chestnut timber, about which these disputes have arisen, is of course that which is now called the Spanish or sweet chestnut, the *Castanea vesca* of botanists, which is said to have been introduced into Italy by the Romans from Castanea in Thessaly. The horse chestnut, so much valued for its early foliage and long spikes of flowers, was not known here till the middle of the seventeenth century; its wood is white and of no utility in building. The sweet chestnut grows in great abundance in Italy and Spain. Immense forests of it clothe the slopes of the Appennines. Milton must have been impressed, as are all modern travellers, by those leafy groves. He tells how the fallen angels lay—

> "Thick as autumnal leaves that strew the brooks,
> In Vallambrosa where the Etrurian shades,
> High over-arched, imbower ——"

It is the tree which Salvator Rosa used to paint; its curious habit of twisting the stem giving to old specimens an extremely wild and picturesque appearance. It abounds all over the South and centre of France wherever the vine grows; and, like it, ceases to flourish in the Northern provinces. In Perigord and Limousin whole communes are covered with it; and in that vicinity alone there exist a million and a quarter acres of chestnut woods, producing fruit to the value, in some cases, of 33s. per acre. In fact it has always been grown in those southern countries as a fruit tree. Virgil could boast of his "ripe apples and soft chestnuts." In France it has been estimated to produce one hundredth part of the native food of the people. As regards its use as timber, one meets with the most contradictory statements. Buffon denied that it was used in ancient roofs, recommending it, as most writers do, for casks. The general opinion is that it is very durable under water, but inferior to oak in ordinary construction, particularly if enclosed in masonry. At the funeral of Pope Pius IX., the body was encased in an inner coffin of cypress and an outer coffin of chestnut wood. Old chestnut furniture of Italian workmanship is sometimes met with.

The scarcity of the chestnut in northern latitudes is owing to it not there perfecting its fruit, so as to compete with such trees as the oak. In the Bôcage of Normandy I have observed great quantities of young chestnut trees planted in the hedge-rows. Magnificent chestnut avenues exist in England—as at Betchworth Park in Surrey, and Croft Castle in Herefordshire; isolated specimens of very great age exist here and in Scotland, and most large estates contain chestnut amongst the ornamental timber. It is very likely that the Romans planted it in this country, and our long connexion with the South of France would be likely to favour, in the Middle Ages, its introduction as a tree. I believe, however, that nothing like a natural forest exists here nor any reliable evidence of an ancient one, and that such of the wood as now comes into the market is mainly due to the stimulus which was given to the planting of chestnut trees about seventy years ago.

As a growing tree the chestnut shoots up straight, and soon forms a good large trunk. Trees of forty years growth are generally sound, but they afterwards become liable to decay, owing to the habit which the tree has of twisting, so as to split the trunk and admit moisture. Mr. Gladstone, speaking as a woodcutter, says: "the pleasantest timber to cut is Spanish chestnut, because it comes away so freely, the grain breaking easily." It has a remarkably small amount of sap, only about three of the rings of annual growth consisting of sap-wood; a large beam of mature timber can thus be cut from a comparatively young tree. The annual rings in chestnut are distinctly wider than in oak; the wood cuts much more easily, and is so much lighter in the hand that this test alone would be sufficient to distinguish it. Of two specimens which I have weighed the oak shews 43½ lbs. per cubic foot and the chestnut only 33 lbs. As to colour, when the two woods are used side by side

there is at first no material difference, but the chestnut ultimately becomes light brown; the oak more of a dark grey. There is, however, one clear distinction, attention to which will make it impossible to mistake one wood for the other. The medullary rays, which in all timber shoot out from the pith towards the bark in exceedingly fine threads, are in the oak collected together so as to form thin plates which are very conspicuous in the end section of the wood. In beech, yellow pine, and some others, there is a slight indication of the same thing, while in chestnut, elm, ash and other woods used in building, these fine threads remain distinct and evenly distributed, so as to be quite indistinguishable by the naked eye.

The plates formed by the medullary rays in oak are exceedingly strong and tough, and appear to add materially to the strength and durability of the timber. They bind together the annual rings and resist their tendency to split apart, which we often find in other wood. As timber is usually cut the cracks which take place in seasoning are perpendicular and do not materially weaken the beam. The plates also run in the same direction as the tenons and mortices, and render the wood better able to resist the rending strain at these spots. The plates remain unaffected by decay long after the woody fibre between them has perished, and when the wood is attacked by the worm we find the medullary plates untouched, except where passage ways have been made through them. When the wood has been subject to great wear, as in the handrails of public places, the edges of the plates stand up above the general surface. These peculiarities are illustrated by the specimens now exhibited.

The best known effect of the medullary plates results from cutting the timber as nearly as possible in lines which pass through the pith. The plates, being not perfectly flat, are crossed many times by the cut, and their hard bright section produces the pattern, so much valued in wainscot panelling, known as the flower or silver grain. In American oak the plates are further apart and more flat so as to be less frequently exposed by the cut, and the flower is much less conspicuous. In some specimens of English oak, particularly in the variety called *sessiliflora*, the plates are very thin and wide apart, and such specimens are often mistaken for chestnut, but a very clean end section will always render the plates visible. Though usually lighter than the rest of the wood, they are often dark, and such specimens have also been mistaken for chestnut. A careful examination of the oldest specimens of oak, such as that from the Irish bogs and from the piles of old London Bridge, shews the same characteristics.

As it is perfectly certain that no sign of a medullary plate exists in true chestnut timber, whether old or young, and no flower or silver grain on its planed surface, it may be asked how it happens that persons, many of whom are practical workmen, fall into the error which I venture to point out? In the larger number of cases, assertions are made either recklessly, or for the purpose of winning a wager, or on the authority of quotations from old books, none of the parties concerned having even seen a genuine piece of chestnut wood. I have, however, met with some architects and builders who, having been taught that certain marks are indicative of chestnut, have carefully explained them to me, and by their kindness I am able to describe what we may call the traditional or imaginary chestnut; and compare it with the real. The following description of this supposed chestnut was given me by a country builder of great practical experience. He says, "It is of a dead chocolate colour; decay commences in the interior of the timber, accompanied with large quantities of powder, which is seldom found in oak; the worm holes are larger, and the timber gives way by breaking straight across the fibres instead of splintering, as does oak. It is of a dead nature, and yields to the chisel uniformly in every direction. It does not ring when struck; there are no star-like rays in the knots; the sawdust is dark, and of an unpleasant smell." Some would add to these particulars that the silver

grain in chestnut is dark in colour, but all seem to think that the wood they call chestnut is inferior to oak, thus differing from the mere retailers of gossip, who think all the best work is chestnut. I need hardly point out that every one of these supposed distinctive features is quite consistent with such specimens of oak as we find, depending on some slight difference of growth, or upon the stage of decay which it has reached, and that none of these specimens will bear comparison with a piece of genuine chestnut wood.

If chestnut wood really existed in old buildings, it might be expected to have come under the notice of the late Sir Gilbert Scott, who last year told me in a letter that he knew of none, nor yet of any record of its use. Mons. Viollet-le-Duc says, in his Dictionary (vol. VI., page 346) that during the Middle Ages, at least in France, oak was exclusively used for the joinery of buildings. I am informed indirectly that he knows nothing of its use in roofs; and although I have heard of some instances, the accounts are so vague as to make it probable that even in the district where chestnut is most abundant it was not anciently used in the best carpentry work.

Upon the whole, I think we may be certain that, of all available woods, only one can be considered fitted, by its strength and durability, for work of the highest class; and that wood is oak. But the question remains as to the value of chestnut, especially as it is likely to become more plentiful. In Normandy, the wood is used for making roof shingles, which from their silvery grey colour are very much more beautiful than shingles of oak. In this country the wood has been hitherto used chiefly in the repairs on those estates where it is grown. One of the largest firms of London builders, whose collection of specimens is very extensive, has no specimen of chestnut. My own specimens of chestnut have been taken direct from the estates where it grew, and where I have occasionally used it for many years. Its clean grain and pleasant working make it very suitable for joinery, and there is no fear of its durability being equal and probably superior to that of any wood except oak. About twenty years since a large bridge was built of chestnut timber, in three spans, over the River Wye, at Hoarwithy near Hereford. It was recently taken down, having been for some years in a crippled condition. This may have resulted partly from the design of the bridge, but was clearly owing also to the decay of the timber at the numerous joints where the water could lodge. This decay could not have taken place in good sound oak in so short a time. Yet the great bulk of the wood, after standing for nineteen years—some of it being painted—was perfectly sound; and this seems to show that, for ordinary work not subject to damp, the timber may be very useful. Although I cannot admit its occurrence in ancient roofs, it may be very suitably used in preference to deal and pitch pine, and in church furniture it would probably in course of time take a colour which would be far better than the stained woods now so much used.

In concluding, I desire to draw attention to some illustrative specimens; among them are oak and chestnut in various conditions. There are also several specimens of oak, sent to me by persons of experience under the impression that they were chestnut,—as well as chestnut which has been actually on sale as oak. I wish to draw special attention to some specimens of chestnut found in Old Shelswell House, in Oxfordshire, where they seem to have been used as far back as two hundred years ago, or about the time when the stories of ancient chestnut roofs began to be prevalent. Mr. G. Wells, the Clerk of Works there, being well acquainted with this wood, has kindly enabled me to lay some of it before you. I hope that further information may be elicited as to the use of chestnut wood in the South of Europe, and if in the Discussion some well-authenticated case of its use in this country in the Mediæval period be brought forward, it will throw new light upon a long disputed point in the history of our ancient buildings.

THOMAS BLASHILL.

Royal Institute of British Architects.

At the Ordinary Meeting of the Session, held on Monday Evening, May 20th, 1878, CHARLES BARRY, F.S.A., President, in the Chair, the following business took place:—

DISCUSSION ON MR. BLASHILL'S PAPER—OAK OR CHESTNUT.

Mr. BLASHILL, Fellow.—I should like to say before the Discussion proceeds that two matters have occurred to me since writing the Paper. In the first place it is not as an archæological but as a practical question that my Paper was written. This (exhibiting it) is a specimen of wood which I say is chestnut. I found carpenters working it up into posts, and one of them offered in the usual style to bet that it was oak. The other thing is this—I mentioned in my Paper that for several years a pallet had been exhibited in the Museum at Kew Gardens as Spanish chestnut from an old beam in Windsor Castle. Sir Joseph Hooker has very kindly sent it, and the Curator, Mr. Jackson, is here and will perhaps like to say a few words. I say the pallet is of oak, but Members will be pleased to see that beautiful specimen of wood whatever they may think it to be.

Mr. THOMAS MORRIS, Associate.—I wish to draw attention to some authorities. Tredgold says the English oaks are of two leading varieties—the one called *Robur* and the other *Sessiliflora*. The former is distinguishable by having the flowers and fruit upon peduncles or foot-stalks—whence the botanic name *pedunculata*. That kind has a much bolder development of the silver grain than any other; and of course it is displayed, as Mr. Blashill has so well shown, in the radial sections and lost in the tangential cuttings. That seems to have inhabited rather the southern counties. The *Sessiliflora* is distinguished by the absence of stalk: the flowers and fruit are situated close to the wood. That makes the botanical distinction, and it is a rather more graceful tree. The wood is darker, harder, heavier, and more elastic than *Robur*. It warps very much in seasoning, but is tough and hard to rend, so that it is found very difficult to convert into laths. This tree inhabits the north of England, and notably Durham, still it is also found in the neighbourhood of London. Loudon says, in his Encyclopædia of Trees, that the name of chestnut-oak is given to this species, because its wood is supposed by some to resemble that of the sweet-chestnut. The French names imply the male oak, the red oak, and the hard oak. Tredgold, again, says the qualities of the different kinds of timbers must have been well understood by the Gothic builders in this country, for in the roofs and beams of almost all their buildings we find a very superior kind of oak which closely resembles and is often mistaken for chestnut. No doubt it is quite possible to make a discrimination; and the roofs at Eltham, at King's College, Cambridge, and elsewhere, will most likely prove to be not chestnut but chestnut-oak. It must not be thought, because fine oak has a resemblance to it, that chestnut is better than oak. Tredgold says "the oak is universally allowed to be the best of woods," and architects are bound to use it, as neglect may be visited upon them if they do not. In

one instance I know an architect thought it prudent to use some fine American walnut for a stable, but, though kyanized, it decayed through the warmth and moisture of the place. The architect was told he ought to have used oak, and he then did so.

A few remarks followed from Professor Donaldson, Past-President, and from Mr. William White, F.S.A., Fellow.

Mr. WYATT PAPWORTH, Fellow.—Having brought this subject before the Institute twenty years ago, I trust I may be excused occupying your attention for a few minutes. It is very satisfactory to me to find that what was then stated has now been so entirely substantiated by Mr. Blashill. There are two drawings before you showing the difference of the leaves and acorns of the two oaks to which reference has been made. To show how the tradition of the use of chestnut has existed, I have here an extract from the *Gentleman's Magazine* of 1817, referring to Greensted Church in Essex, perhaps the oldest building in England; the nave is formed of trunks of trees, which are stated "to be of the chestnut split asunder, set up close to each other, and let into a sill and plate fastened at top by wooden pins." Now our late President, Mr. Thomas H. Wyatt, read a Paper at this Institute, thirty years since, on his restoration of that building, and he describes the timber as oak. I have a letter here, received only this morning from Mr. Wyatt, wherein he regrets not being able to be present to-night, and encloses two small bits of wood from a large roof at Deene Rectory, Wansford, Northamptonshire. The Rector, in forwarding them to Mr. Wyatt, states in his letter, that "the timber is traditionally called chestnut, but that the carpenter believes it to be oak." He had "lately the pleasure of meeting Mr. Street, and he tells me that it is difficult often to tell the one wood from the other. There are no cobwebs observable." The two pieces are so small that by this light it is impossible to decide which wood it may be, but it looks like oak. Mr. Blashill has stated that of the two specimens which he had weighed, the oak showed 43½ lbs. per cubic foot, and the chestnut 33 lbs. In my Paper I mentioned the weights, from Tredgold, of the two woods in a *dry state* as 50 to 55 lbs., and 34 to 38 lbs.; a specimen of the oak I had myself weighed was 55 lbs. I mention this as I consider it a very good test for the timbers in question, where a piece sufficiently large can be obtained. Mr. Neale, in his interesting Paper on St. Alban's Abbey, has referred therein to chestnut, and perhaps he may explain further as to its use in that building. In an article in the *Builder* of Nov. 10, 1877, on English woods, it is stated that "much of the oldest timber in this country is not of the same kind as that now in use;" it then describes the two oaks, the *Q. pedunculata* and the *Q. sessiliflora*:—"this latter is the oak which furnishes timber to some of our oldest buildings,—to St. Alban's Abbey and to Westminster Hall. The old wood is so unlike any modern oak timber in the absence or indistinctiveness of the silver grain that it was long considered to be chestnut." I have brought for your inspection a small table, the legs of which are made of part of the timber of Westminster Hall, removed at the time of some restorations to the roof about 1820; it is apparently this oak. I have referred to the valuable work, *North American Sylva*, by Michaux, published in 1819. He notices that the chestnut is found chiefly in North Carolina, and is 15 to 16 ft. in circumference at 6 ft. from the ground; that it is strong, elastic, and capable of enduring the succession of dryness and moisture, valuable for posts which must be made of trees of less than 10 inches diameter and charred; rails of it last fifty years, and shingles of it are preferred to oak. In reference to the use of chestnut in France, he observes that it is used for hoops of tubs, and when twenty-five years old for posts and light timber. He thus makes no mention of its use in buildings; and in fact it may be inferred it was not so used.

Mr. COCKERELL, Hon. Secretary, read extracts from letters received on the subject from Honorary and Corresponding Members. The following is a communication from M. Révoil, of Nîmes :—

"Marseille, 14 Mai, 1878.

"MONSIEUR ET TRÈS-HONORÉ CONFRÈRE,

"A la réception de votre lettre, je me suis empressé de prier un de mes amis de me traduire le mémoire qui l'accompagnait; je reçois aujourd'hui cette traduction, et je puis vous répondre après l'avoir lue attentivement.

"Je dois commençer par vous dire que ma vie s'étant passée, dépuis que je professe mon art, près que toute entière dans le Midi, dont j'ai étudié avec soin les monuments les plus curieux, mes réponses ne s'appliquent qu'à cette région de la France.

"1°.—J'ai relevé des charpentes, et surtout des planchers peints, du moyen âge : ils étaient tous construits avec du bois de sapin, ou du bois de chêne : je puis citer la grande salle du Château de Capestang, près Narbonne (Aude); le Cloître de Fréjus (Var), deux maisons du XII^e^. siècle au Pont-St.-Esprit (Gard); le Château de Tarascon (B^s^ . du Rhône), dont les plafonds et les charpentes décorées sont en sapin. En fait de grandes charpentes d'Eglise, nos monuments du Midi de la France offrent peu d'exemples : car ils sont près que tous couverts en dalles de pierre.

"2°.—J'estime, pour ma part, que le chêne est bien préférable au châtaignier pour toute œuvre de charpente ou menuiserie. Après lui, pour la menuiserie seulement, nous employons le Noyer, et l'Aube—sorte de peuplier à feuilles argentées.

"3°.—Le paragraphe précédent contient une partie de ma réponse à votre troisième demande : j'ajoute que nous n'employons pas en France le châtaignier dans des charpentes importantes.

"4°.—Le chêne sera toujours préféré : mais le sapin de Bourgogne et de Norvège lui sont substitués dans beaucoup de charpentes très importantes, par économie.

"M. Viollet-le-Duc, notre illustre maître, comme érudition, qui connait si bien les monuments anciens et de toutes les époques de la France, a traité cette question dans son savant ouvrage sur l'architecture de notre patrie : le mémoire de Mr. Thomas Blashill le cite, et vous connaissez son opinion.

"Il est possible que dans quelques pays de nos montagnes le châtaignier ait été employé en planches, ou comme petites pièces dans des charpentes d'eglises de village : mais je ne crois pas qu'on l'ait jamais mis en œuvre pour les gros bois, tels que les arbalétriers, les entraits, les poinçons, ou les pannes.

"Telles sont, Monsieur et très-honoré confrère, les seules indications que je puis vous fournir sur cette interessante question : j'en ai causé avec notre doyen, M. Pascal Coste, notre bien digne confrère; il n'a eu dans ses souvenirs—lui qui connait si bien aussi la France—aucune charpente de bois de châtaignier à me signaler.

"Ce beau vieillard est vraiment admirable : à 90 ans passés, il dessine encore avec la sureté de main d'un jeune homme, et s'occupe à remettre en ordre tous les précieux croquis de ses longs et nombreux voyages.

* * * * *

"Agréez, Monsieur et très-honoré confrère, l'expression de mes sentiments de respectueux devouement,

"H. RÉVOIL,

"*Membre Hon. et Corr. de l'Institut Royal des Architectes Britanniques.*"

The following is the translation of part of a letter received from the Commendatore de Fabris, Hon. and Corr. Member, Florence :—

"In mediæval constructions chestnut was never used. It has little strength; is not durable; and is ill adapted, in spite of its dimensions, for use in large works. Sometimes, in country districts, it is employed for building purposes in the absence of oak or pine; and in works under water, when it is quite green, it hardens and becomes incorruptible after long submersion. Chestnut is easily worm-eaten if exposed to the air, and sometimes gives way unexpectedly."

[The following extract from a letter received by the Hon. Secretary since the Discussion, from the Chevalier Da Silva, Hon. and Corr. Member, Lisbon, is in almost direct contradiction to other letters on the same subject from Italy and France :—

"In the old buildings of the Middle Ages (*de chez nous*) preference was given for carpenter's work to the wood of the chestnut; but great care was taken to make use of the wood of trees completely grown, and when the colour of the wood is dark. Under these conditions chestnut resisted the attack of centuries much better than oak; which latter was only used for door-posts and window-frames. We have the carpenter's work of the *grand salon* at the Palace of Cintra and other well known buildings in which the carpenters' work is all chestnut. At the present moment chestnut is only used for roofs; but as the wood is cut before it is ripe, and while it is of a white colour, it is attacked by insects, whereby it is transformed into black wood, and then becomes as fragile as an ordinary wafer."]

Mr. G. H. Birch, Associate, referred to some roofs in Brittany. In churches he had visited, the smaller rafters and planking were often of chestnut.

Mr. Jackson, Visitor.—I do not know that I can enlighten the Institute very much on this point. With regard to the question of the three species of oak that have been referred to, these are *Quercus Robur*, *sessiliflora* and *pedunculata*. These three forms are now considered as one species and placed under *Quercus Robur*, the botanical character of the two latter being considered rather as varieties than distinct species. With regard to the woods, I have examined a great number of specimens that are contained in the Museum at Kew, and have come to the conclusion that it is not an easy matter to distinguish them, as the characters of one run very much into the other. Until reading Mr. Blashill's Paper I was not so well acquainted with the structure of the chestnut wood. Since then I have examined some true chestnut, as well as the pallet, which has been labelled in the Museum "Spanish Chestnut," and I have no hesitation in saying that Mr. Blashill is quite right in calling it oak. With regard to the question of North American chestnut, I do not think that that can be brought to bear upon the question at all. The chestnut mentioned is a distinct species from the European. Moreover, we know that differences in soil and climate often considerably alter the characters of plants and trees, and consequently of their woods.

Mr. Armitage, R.A., Hon. Associate.—All my life I have studied entomology, and so have a good knowledge of insects. Now, I have never known but one species of beetle that ever attacks the chestnut wood, but the oak is attacked by myriads. There is no wood which is so subject to the attacks of insects as oak, and no wood so free from them as the chestnut. This may affect the relative durability of oak and chestnut.

The President.—Does the same remark apply to oak and chestnut under water?

Mr. Armitage.—Water beetles are almost all prædacious. At any rate, there are no wood feeders under water. The destroyers of submerged timber belong to a different order altogether,

about which I know nothing. I believe chestnut wood to be very durable under water; at any rate no water insect will attack it.

Mr. H. NEWTON, Fellow, believed that Moorfields was very largely built of chestnut.

Mr. BLASHILL.—I did not treat this as a question of the different varieties of oak, but a question has been raised about a third kind. There is a variety between *pedunculata* and *sessiliflora*; it is known in Hampshire as the "Durmast" oak. The difficulty having been mentioned of judging between oak and chestnut, I wish every member to satisfy himself by examination of specimens, and not take my word for it; and I am sure that anyone who does so will feel that those who speak in this way really know nothing of the true chestnut. The two woods are so entirely distinct, that if any person who has the ordinary means of perception will spend two minutes in examination, he will never again have any difficulty in seeing the difference. I am very much obliged to Mr. Cockerell for getting the foreign information, because I had great difficulty in obtaining any. There are two kinds of American oak. I have a specimen of one kind on the table. I believe the number of insects which feed upon the oak is as nearly as possible two hundred. Mr. Newton does not quite make himself responsible, I think, for the chestnut wood in the building of Moorfields. The chestnut is known not to be indigenous to this country.

The Discussion having terminated, the vote of thanks to Mr. Blashill was carried unanimously; and Mr. T. Chatfeild Clarke, Fellow, was called upon to read his Paper on "Popular Criticism as applied to the Architectural Profession." The Paper will be found on the next page.

POPULAR CRITICISM AS APPLIED TO THE ARCHITECTURAL PROFESSION.

By T. Chatfeild Clarke, Fellow.

It cannot with truth be said that the profession to which we belong has lacked criticism in these latter years, nor can it be denied that the tenour of such criticism has been in the main unfavourable; and it has seemed to me both a necessary and a useful task to seek for a little while, on what basis such criticism rests—whether there is any true ground for an adverse judgment, and whether it is not both wise and desirable to take any steps that may approve themselves to disabuse the public mind, and to promote a tone at once healthier both as to the functions, scope, and aim of the architect of to-day.

This depreciation of the architectural profession has taken two forms—First, an assertion that the art of architecture has retrograded if it be not wholly lost; indeed, it has become perfectly evident, and it is useless to attempt to conceal, that not only in the conversation of society, but in the periodicals, journals, and literature of the day, there is an assumption that in the building art there is little else but failure. As late as 1877, in a lecture on art, by a Member of the House of Commons, at the Whitehaven Scientific Association, the lecturer lays down two things for granted: First, "That good reasons exist for considering the subject of architecture; and Second, that those "reasons are founded not upon the present perfections of art, but upon its imperfections; not upon "the success of its professors, but upon their failures, notwithstanding the enormous amount of "employment of architects in the present day—notwithstanding the number of Societies and "Institutions, and Schools that abound all over the country, the periodicals and speakers that deal "with the subject invariably—I may say universally—declare that art and architecture have not "progressed in our age, but that on the contrary they have retrograded."

This is a strong statement. I have given it in the words of the statement itself, in order that I may not in any way be said to misrepresent the lecturer's views, and it would be easy to multiply further quotations. But unfortunately for the profession to which we belong, the charge does not end there. The second form of the indictment is this: that architects are to a great extent untrue to the interests of their clients in the execution of their vocation, that they are far more anxious to execute commissions than faithfully to look after both the completeness and thoroughness of their buildings; it is constantly inferred, if not expressed, that they are far less anxious to keep down the cost of their buildings than they ought to be; that by the system of payment by a per centage on outlay there is a direct inducement to increase the expense of their works with its consequent results, and that the public ought to be warned against the delusion of employing "eminent names" in the works from day to day going on throughout the country. I must confess it requires a good deal of equanimity and dispassionateness of temper to hear these charges repeated so constantly as they have been of late years. It is to me a sign of a want of self respect and regard for our calling, if we do not inquire into the truth of these reiterated statements and endeavour to refute them, and I know of no subject so practically useful to the profession at large, as to boldly meet them, and court the fullest inquiry.

There is little doubt that the action of some of the public departments in this country by their treatment or avoidance of skilled architects, is giving a sanction of most injurious character to this tone of popular criticism, and the distrust shown in other quarters is indicative of the same feeling.

It cannot be denied that the tone of such an acute writer as Sir Edmund Beckett, in his "Book on Building," is in some senses unfavourable to the architectural profession. It is in a great degree advice to the general public to protect or "hedge" themselves against showing any great confidence in or giving a latitude to the architect in the execution of any given work; it is as much as saying: "Be ever on your guard as to his crotchets; do not give him the fullest scope in his art-judgment; carefully see that the mind of the employer is open to negative, to correct and alter anything where he may see fit to do so;" in other words, consider the architect in relation to his work as in a measure the exponent only of the employer's mind.

In a Paper read before the Architectural Association last year, I just touched upon the subject of the receipt by architects, as it was alleged, of illicit commissions, and I did so with some warmth; but as the Institute throughout has before the public unhesitatingly shown the desire of its members that such practices, if they exist in their own body, should be repressed, and that even the law should be altered to effectually meet such cases, I see no further need to refer to this portion of the subject.

It cannot be denied that here, also, was shown an "animus" in some of the leading journals of the day to readily insert charges where the proof was withheld from the public, or full details of the transaction; and it must be a source of satisfaction to the conscientious and straightforward practitioner to feel that those most cognisant with the large body of the profession would know at once that such charges were untrue.

One fact must be acknowledged in reply to the two heads of charge which I have referred to, that spite the earnest recommendation of certain writers to exalt the "workman" into the sphere of the architect as the only sovereign remedy for the present state of Art, it is the architect of to-day who is most interested in arresting the decadence of Art-workmanship, and who has endeavoured in many ways to raise the workman to a higher aim and sphere, knowing fully well, and feeling thoroughly, that the imagined antagonism is all "a myth;" that the true idea is for each and all to go hand in hand in the execution of the building with the aim of its entire completeness; and I express, I am sure, the unanimous view of the profession, when I say we wish well for every effort to raise the Art-workman—nay, more, we will assist in every well considered effort for this purpose.

Dismissing, then, these side issues we are brought face to face with the fact, paradoxical as it seems, that, notwithstanding all the depreciative criticism of the architectural profession, it flourishes: our towns and cities bear evidence which they never showed before of professional work in many a church, town-hall, market-house, or other building; and that no considerable structure is ever now undertaken without the services of an architect; and that if even a private house is built without the services of one, it is the general and candid acknowledgment afterwards that a great mistake had been made, and how many things could have been improved by the employment of a skilled man.

Now to enter into the province of a careful criticism as to whether architecture as an art in the present day has retrograded, more especially as arising from the prevalent adoption of *one* style instead of *another*, would lead me too far, and I will admit this, that to expect the creation of genius or great originality in style or treatment seems for the present at least in any style not possible. Whilst fully admitting this position, I do not think it affords any ground for unfavourable criticism specially as regards the architectural profession. It would apply to the whole field of art-design in painting, sculpture, or the like. The times in which we live, with all the material progress and the scientific resource as applied to art-manufacture, are probably by those very conditions unfavourable to that instinctive love of, and creative power, which the history of the world shows to have been possessed in ruder ages and under very dissimilar states of society. But no good can possibly arise from

depreciating the honest and genuine work of men, who are consciously alive to the needs of giving to society the most chaste forms, and who give most careful study to such forms of art as are most congenial to them.

I think a candid and truthful statement of the position is this, that in all styles, whether classic, gothic, or what not, there is a large amount of careful and cultivated design produced, combined with sound building and foresight, and an amount of earnest thoroughness to develope any special line of art, that instead of laying the profession open to the charges of being a "soft-handed" and "dainty" body of gentlemen, careless of design, and "only seeking to trade on the ignorance of the public," the reverse is often the fact, that by an earnest desire to carry out what they believe to be true in art and design they break somewhat into the practical necessities of the building in question, and incur odium as students for want of practicality in execution.

I feel sure it is impossible to deny that taking a wide survey throughout England and comparing the buildings of to-day with those of 50 or 100 years since, there is a greater amount of scientific and artistic skill evident in them, and that architects have reaped a just reward in the increased demand for their services, as well as the confidence shown by the more enlightened portion of the public in their estimation of their works.

I am prepared to take any *test* which can be fairly applied, and one which most readily occurs is this: compare much of the speculative house-building in the Metropolis and elsewhere, generally put up without the services of an architect, with such houses as are designed and executed by an experienced professional man, and I think there will be no doubt as to the result.

To those at all acquainted with such matters the difference is apparent at a glance, in proportion, in symmetry, in finish, in the care and detailed nature of its arrangements, the hand of the designer is at once apparent, *and shall we then silently permit such charges as that of "imposture?"*

The truth is, that spite the shortcomings of our practitioners, which none know more than themselves, there is an amount of conscientious and often loving work executed, for which the designer receives but scant acknowledgment, but which reflects lasting credit on himself.

Again, another test may be taken of some value with reference to the architectural profession, and that is the experience of those men who have built without the intervention of one, and who have trusted wholly to the builder. I am sure, the experience of those who have done so, such cases mostly giving rise to litigation between the employer and builder before or after the completion of the work, either as to the mode of execution of the work or the cost, must be a lesson to those who would do likewise, and it is a most satisfactory testimonial to the value of the profession, that the builders as a body, though with some honourable exceptions, very much desire to evade the connection of any building matter with an architect; their willingness to supply designs without cost to their employers, and estimates, being the delusive bait for future trouble and enhanced profits for themselves.

With respect to the practical execution of works and the allegations made under this head, it may be as well in a few sentences to explain what I conceive to be the relation of the architect and his employer.

I hold that an employer or client once having selected the best man for the work he has in contemplation, must unhesitatingly and without reserve, for its success, give the architect his fullest and most complete confidence—under no other circumstances can the architect act with any chances of success, the desire to conceal from the architect any questions about ultimate cost, any wish on the part of the employer to be in a position to check his architect as to the nature and disposition of the design, and any leaning to prepare such a contract as shall place the architect in the contractor's

eyes as a mere instrument of the owner, and not in the responsible, though difficult relation of a high-minded, but *fair arbiter* between the owner and the builder, will result in complications and final dispute.

Accepting, then, that these are the terms of the true relation of an architect and his employer, what remains to the relation? Of course the first step is that the owner should as intelligently, and with as much care as possible, instruct his architect as to all the wants and requirements of the matter in hand, and not leave, as it is too often the case, the architect with imperfect instructions, and at a later stage for the employer to complain that the design does *not* meet his wants. I hold, then, that a cultivated and careful knowledge of the necessities and general scope of the building required, when more fully understood by the public, would assist the architectural profession materially, though I doubt much whether that rather "fussy," "half knowledge," which goes still further, and which interferes with the detailed execution of works, does operate to the general success of the execution of the design as a whole. The question then arises, do the architectural profession as a body respond to this true ground of their relation, and by the care in the execution of their works merit the confidential relation that should exist? Do they in fact, as a body, merit these hard sayings not unfrequently indulged in? I think no more satisfactory answer can be given to this question than to look to the result of a large amount of building in the Metropolis of late years; I mean, of course, that specially attended to by architects. It may with confidence be asserted, and I am sure it will be endorsed by many of my brethren, that the success that has attended large building investments carried out under their superintendence, must have been to them the source of much solid satisfaction. To feel that you have assisted to form a solid property for a man to hand down to his children by devoting much thought to its development, and that looking on it as a moral duty not to embarrass such investments by any careless outlay largely beyond the stipulated amount, you have asserted the true position of a confidential adviser, and you merit the respect of the public.

What, then, becomes of these charges? Your accusers must begin by believing and by charging in the face of all evidence a large and respectable body of men (doubtless with some exceptions) as lost to their very first duty of moral conscientiousness and duty, in order to secure some paltry additional commission, and some personal benefit to themselves. The charge carries with it its own refutation, and I dismiss it as unworthy of serious consideration. It will be maintained by some that the objections to the practical work of architects lie in quite another direction, viz. that of not meeting the special wants of a building, and often making it unsuitable to its end. Now I will admit that I think the special training and exclusive study of one subject does very often unfit the mind to deal with modern wants as a whole, and that to some extent architects lie open to this charge. A wider general cultivation and a deeper interest in and mixing more with society in other relations would help rather than hinder architects in their special vocation, and they would be fulfilling far more truly the highest aims of life by taking their part in the general work of the world, and this wider knowledge of men and things is much to be desired; but then it should be remembered that this special interest in and devotion to their calling arises from a love for and an appreciation of its great claims.

The real difficulties that beset the architect are the complex questions that arise in the use, especially of public buildings on such questions as heating, ventilation and the like, and the varying conditions under which they are tested; the limitations also of cost must be borne in mind, the peculiarities of the site, the limiting and cramping nature of the instructions originally given in many cases, and the necessity of meeting the special wants of the head of some department at some sacrifice to the rest of the building. The public, who judge merely after completion, do not take into

account these varied difficulties, and visit on the head of the architect the special want or failure, as it may be, when, if the truth were known, the defects may have been the special point or difficulty he has been struggling with during the execution of the design. It may, I think, with truth and yet with modesty, be affirmed that there is no vocation connected with the arts requiring so mixed a class of qualities as that necessitated by the architect, which may be briefly summed up as follows: a knowledge of the laws of design and style, a practical acquaintance with construction and materials, necessity for the considerations of cost and the requirements of modern society, the qualities of a man of business in the preparation and management of contracts, and a knowledge of the associated arts and mechanical and scientific contrivances forming a part of all large structures. Can it be said, looking at much of the work in the present day, that any of these qualities are wanting, and if so where are the true grounds of complaint?

The only further head I shall very briefly treat is, whether the attitude of Public Departments in relation to architecture and the non-recognition and want of direction of architecture by the State is to be regretted, or the contrary? No doubt the allegations so recently spread with regard to one special building must have had some foundation, and the result is to be regretted, but the question at once occurs, are you from any single case of the kind to resort to a mode of carrying out Public Buildings which in the long run must be detrimental to public taste? Is it not within the cognizance of every one that there are public buildings existing in the Metropolis and elsewhere, which, whatever their merits may be as regards *internal* convenience, cannot be deemed successful from an *art* point of view?

It cannot be denied that the true attitude of the Government of any country towards art generally, and of course therefore towards architecture, is to give that encouragement by the employment of competent men as may best conduce not only to develope taste among the people at large, but also to give the most permanent examples of good art to the nation for after ages to rest upon. Not in any way necessarily confined to one style or the other, but by a Catholic and liberal judgment and consideration of all Schools of Art entrusted to a Minister of State would be the right way of developing art in this country I venture to affirm. It is a trust reposed by the people in the Government of the day for the benefit of the nation to wisely deal with an expenditure raised by taxation, and in the scant recognition of and evident desire to avoid the services of high class professional men, shown in some recent inquiries, it becomes specially necessary that the public should be alive to the probable result of leaving large works to mere departmental officers, or to their supernumeraries, the training and education of such men being, doubtless, amply sufficient to know and detail the accommodation required, but unfitting them to design national monuments. Of course the objection raised that the appointment of any such Minister, as I have indicated, would result in a series of attacks upon him should be put aside, if we are convinced that the course is a right one, though he must be a man with the force and power to maintain his views with reason and ability before the public. The further objection that any extensive patronage of art would in the end lead to its decay and destroy healthy competition and the growth of art generally, is not applicable to the view I am urging, for I should deprecate any large or active interference beyond the wants of the national work, and specially should deplore the cramping influence of any particular school.

To sum up the results of my Paper then in one word I would say this, that the charges so freely made are "not proven," that in art work, in conscientious discharge of their duties, and in repudiation of any graver insinuations, the profession can stand the fullest inquiry, and that it is not undesirable by the means of the press, the lecture room, public speech, and otherwise, for the

profession to show that they are prepared to maintain their own position and to submit frankly their claims to the public at large, who with generosity and fairness always deal with a question they fully understand.

The PRESIDENT.—The reader of the Paper prefaced it by saying that he only intended it to be a preliminary Paper, and that he only wished to excite a Discussion which might lead to good. My feeling is that he has given us a great many subjects to discuss; indeed, he has managed to give us a syllabus that might occupy a whole Session and lead us into profitable discussion affecting ourselves, the public, the Government, the builders and so forth. I cannot hope, therefore, that the subject will be in any way exhausted to-night. At the same time we have a little time at our disposal, and without entering too much into the "self-laudatory," it would be very useful to discuss those points which he has laid down—charges of incapacity, inefficiency and something worse; and to endeavour to allay this evil spirit.

Mr. W. A. BOULNOIS, Fellow.—I think that this Discussion would best be ordered by the *clôture*. I believe every man who has practised his profession feels a degree of humility at his own mistakes, but the less we find fault with people who criticise us the more we shall do justice to ourselves —*ars est celare artem*. If we cannot stand upon our own merit as artists and architects, but want to puff ourselves and tell the people that they are doing us injustice, we are not following our art; any discussion we might take up would only result in bombast. I contend, sir, that the attacks which have been made upon us have been thoroughly answered. We have elected to-night a gentleman, one of our bitterest critics, who by coming amongst us shows that he appreciates our profession and this Institute; we all stand in this room and before the public without any occasion to white-wash ourselves. I trust that we shall not go into a Discussion which can only result in self praises and platitudes.

Mr. E. CHRISTIAN, Member of Council.—I entirely agree with Mr. Boulnois, and shall say nothing.

Mr. O. HANSARD, Member of Council.—We may however propose a vote of thanks to Mr. Clarke for his exertions, and I have much pleasure in doing so.

Mr. W. KIDNER, Fellow.—I do not altogether agree with Mr. Clarke that the criticism to which architecture is exposed is undeserved. I think much of it is deserved, and for that reason the less we say about it the better. For my own part it happened in my career that I was nine years absent from England. I had heard of new streets and new buildings having been constructed, and one of the things I looked forward to with great pleasure on my return was to see all these new works. But how was I disappointed! I found that the old buildings I had been taught to admire were still the best works in London. The trouble to my mind is that there is too much craving for novelty, and you will never improve the architecture of our buildings until you can make the public more discriminating. As long as you can find men to pander to uncultured taste, so long will you get the vulgar erections we now see about this city.

The PRESIDENT.—Mr. Boulnois has succeeded in bringing our Discussion to a close in the most emphatic way. I am not quite disposed to go so far as that. To say that we have no faults and no reason to be criticised, that we have no misunderstandings on the part of the public towards us would be, I think, misleading to ourselves. I cannot, therefore, agree with him. There is, generally speaking, in all these changes a certain amount of justification, and we must bear in mind that ours is not the only profession open to criticism—doctors and lawyers are most unmercifully criticised, and it is not to be supposed that in such general criticism there is no justification; for in all these

charges, though there is much that is largely false, there is a little that is slightly true. I do not think it is very undesirable to separate the wheat from the chaff, and say we have nothing to refute, but that "we are uncommonly clever fellows, and we shan't at all attempt to defend ourselves." I can't quite go so far as that. I think, with my friend Mr. Chatfeild Clarke, that we may appeal to results in architecture; and that we may, without egotism, fearlessly compare the last twenty-five years of art progress with the quarter of a century that preceded them—and in spite of the criticisms of a speaker we have heard to-night. With respect to one of our most unsparing critics—Sir Edmund Beckett—I have had some correspondence with him lately, and the gist of it has been for him to say that, although he has a good deal of architectural knowledge, and flatters himself that he knows a good deal that is disparaging about architects, he has made it a practice to recommend to all those who will take his advice on structural matters: Always employ an architect. Reference was made by Mr. Chatfeild Clarke to the action of the Government, and I think that is a point we ought not to give the go-bye to. There again, through the new class of Honorary Associates (which has justly become a distinguished class amongst ourselves), we enrol the First Commissioner of Works of the present day, and the Permanent Secretary. I think it possible by having these men among us, and talking with them, and making them see the real difficulties as well as the advantages which are evolving themselves from skilled minds, that they may gradually see the necessity of advising the Government for whom they act to come to professional men of repute rather than take the chance of the most skilled draughtsman, whom they may have to assist in their department. Mr. Clarke touched upon the action of builders. I think that we have a good deal to be ungrateful for (to use no stronger word) to the Messrs. Cubitt. I do not mean the Cubitt of the present day, but Thomas Cubitt who rebuilt so much of London. He knew enough to do his work so uncommonly well, as far as practical convenience is concerned, that he was able to compare his buildings with others that would not bear any such comparison. He gained the credit of eclipsing, with a practical builder's house, that of an architect; but although praise may have been deserved by him, it is by no means universally deserved by others. I think he did us some degree of mischief. I have felt bound to make these few observations, because I do not quite agree with Mr. Boulnois, although he was seconded by Mr. Christian, that we should say nothing as to the interesting point Mr. Clarke has put before us.

A vote of thanks to Mr. Clarke was then carried.

Mr. CHATFEILD CLARKE.—I beg leave to return thanks for the vote you have just passed, and especially for the kind words of the Chairman. I wish I could lay to my soul the flattering unction contained in Mr. Boulnois's words, and that we could hide our heads and say nothing as he recommends. A great number of us are not prepared to take that course, or stand the sort of criticism that is daily indulged in in almost every drawing-room in the country. The depreciation of architects in the last few years has been very marked, and, if it is not met, these attacks will be continued. The time has come when professional men like ourselves must take our stand, and be prepared to maintain our position and maintain the just claims of our profession before the public. Mr. Boulnois's view has been held long enough and it has utterly failed, and we must now take another course. I thank the Meeting very much for their kind attention.

GENERAL CONFERENCE OF ARCHITECTS, 1878.

COMMITTEE.

Professor LEWIS, F.S.A., *Vice-President,* in the Chair.

CHARLES FOWLER,	T. H. WATSON,
T. ROGER SMITH,	H. H. STATHAM,
J. DOUGLASS MATHEWS,	BOWES A. PAICE, *President Arch. Association.*

ARTHUR CATES, } *Hon. Secs. Conference*
R. PHENÉ SPIERS, } *Committee.*

PROGRAMME.

Monday, 3rd June. OPENING MEETING. Presentation of the Royal Gold Medal and of the Institute Medals and Prizes. Opening Address by CHARLES BARRY, F.S.A., *President.*

Paper by E. ARMITAGE, R.A., *Hon. Associate*: Subject, "Mural Painting."

Tuesday, 4th June. VISIT TO THE NEW LAW COURTS (Strand Entrance). G. E. STREET, R.A., *Vice-President*, was present to conduct the Members.

VISIT TO ST. PAUL'S CATHEDRAL (West Entrance) to see the Wellington Memorial, and afterwards to examine the precautions taken to protect the dome from fire. F. C. PENROSE, M.A., *Past Vice-President*, conducted the Members.

THE INSTITUTE DINNER. THE PRESIDENT in the Chair.

Wednesday, 5 June. VISIT TO DORCHESTER HOUSE, PARK LANE, by the kind permission of R. S. HOLFORD, Esq.

VISIT TO THE PICTURE GALLERY, Stafford House, St. James's, by the kind permission of the DUKE OF SUTHERLAND, K.G.

VISIT TO THE PICTURE GALLERY, Bridgewater House, by the kind permission of the EARL OF ELLESMERE.

MEETING. Paper by PROFESSOR BARFF: Subject, "The Corrosion of Iron." Chair taken by Professor LEWIS, F.S.A., *Vice-President.*

Thursday, 6th June. VISIT TO THE NEW NATURAL HISTORY MUSEUM (Central Entrance, Cromwell Road), South Kensington. ALFRED WATERHOUSE, A.R.A., *Member of Council*, conducted the Members through the Building.

MEETING. Discussion on GENERAL BUILDING REGULATIONS FOR THE UNITED KINGDOM.

Paper by J. DOUGLASS MATHEWS, *Fellow*: Subject, "The Model Bye-Laws as a basis of a General Building Act." Chair taken by JOHN WHICHCORD, F.S.A., *Vice-President.*

Thursday, 6th June. MEETING. Discussion on CONCRETE AND FIRE-RESISTING CONSTRUCTIONS. Opened by ARTHUR CATES, *Fellow.* Chair taken by GEORGE GODWIN, F.R.S., *Past Vice-President.*

Friday, 7th June. VISIT TO MR. KIRKALDY'S TESTING WORKS, Southwark Street, when his Apparatus for Testing the Resistance of Materials used in Construction was explained.

MEETING. Paper by EDWARD I'ANSON, F.G.S., *Member of Council*: Subject, "The Iron Ribs to carry the Roofs of the Corn Exchange in process of re-erection in Mark Lane." Chair taken by E. M. BARRY, R.A., *Member of Council.*

PAPER before the Architectural Association at the Rooms of the Institute on "Rude Stone Monuments," by T. ROGER SMITH, *Fellow*; followed by a short Paper on "Troy and Mycenæ" by J. S. PHENÉ, LL.D., F.S.A., *Fellow.* Chair taken by BOWES A. PAICE, *Associate*, President of the Architectural Association.

Thursday, Friday and Saturday. VISIT TO THE GALLERIES OF GROSVENOR HOUSE, by the kind permission of the DUKE OF WESTMINSTER, K.G., *Hon. Fellow.*

Royal Institute of British Architects.

GENERAL CONFERENCE, 1878.

At the last Ordinary General Meeting of the Session, being also the Opening Meeting of the General Conference, held on Monday Evening, June 3rd, 1878, CHARLES BARRY, F.S.A., President, in the Chair, the ROYAL GOLD MEDAL was presented by him in the following terms:—

MR. WATERHOUSE,

It is a personal gratification to me that it becomes my duty this evening to be the medium of conveying to you the outward symbol of the high esteem in which you are held by your professional colleagues. It is unnecessary for me to explain to you, an old Member of this Institute, the meaning and intent of the Queen's Gold Medal, which has now for many years been so graciously committed to our body, and as to the annual destination of which Her Majesty is always ready to take our advice. No personal favour originates or can confer this honour. It is absolutely free and open to those—and those only—who in the opinion of their colleagues and rivals merit it. This being so I can sympathise with and fully appreciate the feelings of pardonable pride with which you receive it.

You have this year been chosen by your colleagues here from among many worthy men and eminent architects like yourself. The Council's recommendation has been ratified and endorsed by the concurrence and approval of all Members of this Institute, and you deservedly find yourself one in a list of eminent men to whom this Medal has before been accorded. Their ranks have unhappily been recently thinned by the death of some of those most distinguished among them in the past and present generation, but their places will, I cannot doubt, be filled by those who as in your case are no unworthy successors.

That this is no metropolitan honour, but an Imperial one, is evidenced by the choice in you of a man who beginning his practice in the provinces—becoming there by his rare merit distinguished as an architect—has followed up his early promise by coming to London, there also to hold his own and increase his fame by the erection in the metropolis of buildings which are worthy sequels to his provincial triumphs in such works as, at Manchester, the Assize Courts, Owen's College, and latterly the magnificent Town Hall. Here in London your fame may well rest on so successful a work as the Natural History Museum promises to be, when it has received its final impress from your hand.

I can well believe that the well-known modesty of your disposition will

shrink from these references to your title to receive this Medal, but as President of this Institute it is my duty, even if it were not my pleasure, to record some few of the works which own you as their author. Besides those to which I have referred, it is but right to allude to the work done by you at the Colleges of Balliol, Pembroke, and Caius, at Cambridge; to your great Hotel at Liverpool and the Seamen's Orphanage in that city; to the numerous mansions of our nobility to which you have added architectural beauties—in all parts of England —of which I will spare your susceptibility the detailed list, as they are doubtless well-known to and admired by many now in this room. Suffice it to say that whether in municipal, ecclesiastical, or domestic works, you have fully shown yourself in the best of all senses "A Master Mason."

We in this Institute are not alone in according to you well-merited honour. It is pleasing to us to remember that this present year has seen you elected an Associate of the Royal Academy; we feel that in your person that body has only justified its own position in professing to be the representative of all the Fine Arts among which we architects proudly claim that our Art should be recognised to even a larger extent than is or has been the practice of that rather exclusive body.

May you long live to enjoy the honour thus conferred upon you, and I hope I do not misunderstand the ambition of a true architect if I anticipate that this honour done you by your compeers will be among those most cherished by you, whatever higher or further dignities may await you.

Mr. Waterhouse having received Her Majesty's gracious gift from the hands of the President, acknowledged it in the following terms:—

Mr. President and Gentlemen,

It is somewhat unfortunate that when words are most wanted, they are often least at our command. I wish I had them to-night—and fitting words —to express to this Institute the deep sense I have of the honour its members have done me in recommending my name to Her Most Gracious Majesty, as their chosen recipient of the Royal Gold Medal. This distinguished honour has come upon me very unexpectedly. I have no right, I feel, to criticise in any way, the propriety of the award which has been made in this case; but in the midst of all your generous words, Mr. President, you have forgotten to mention one circumstance. You have left it to me to hint, that if two or three Members of Council, myself among the number, had been attending to our duty, as we perhaps ought to have done, on a particular occasion, somebody else might now have been making his acknowledgments to you instead of myself. I cannot conceal from myself that there are many whose claims to

this great honour are far in excess of my own. Of course it would be idle in me, gentlemen, after the long catalogue of my shortcomings which the President has just presented to you, to pretend that I have not had great opportunities—thanks to those who have accorded me their generous confidence; but I confess it is somewhat humbling to me to reflect that there are others, who with fewer opportunities, have done better work, and yet are without their gold medal. Such reflections have constantly recurred to me since the day I heard of your generous determination to award me this most distinguished proof of your regard. Many of those—I may say all—who have preceded me in this honour, have been men to whose learning and attainments I can make no approach; who have been distinguished as much by their archæological knowledge and research as by their genius as practical architects. I accept the Medal you have just conferred upon me as a proof, if any such were needed, that you are willing to recognize the efforts of one who would put in a plea for architecture to be considered, on some occasions, at any rate, as distinct from style and archæology. At such a time one is apt to be egotistic. Pardon me if I have been disagreeably so, and once more receive my most heartfelt acknowledgments for a gift which will not only be among my most precious possessions as long as I live, but which will be so regarded, I feel sure, by my descendants as long as I have any.

The Distribution of Prizes then took place in accordance with the Awards made at the Special General Meeting, held on the 18th March last; and the following Medals and other Prizes were presented to the successful Competitors by the President:—

The Soane Medallion (with the sum of £50. added under the usual conditions of continental study) - - - - - H. M. Robinson.

*** Awarded to Mr. Robinson for his Design of a Convalescent Hospital for Sixty Patients, distinguished by the motto "*Fortuna sequatur.*"

The Tite Prize of £30. - - - - - - - - - Henry Tanner.

*** Awarded to Mr. Tanner for his Design of a Façade of Buildings in a Principal Street of the Capital, submitted under the motto "*Tite.*"

The Grissell Gold Medal - - - - - - - - - W. G. B. Lewis.

Extra Prize: A Medal of Merit - - - - - J. Martin Brooks.

*** The Grissell Gold Medal was awarded to Mr. Lewis for Drawings shewing the Design and Construction of two Bays of a Groined Cloister, date 13th Century, distinguished by the motto "*Nunc vel alias.*"

In the same Competition a Medal of Merit was awarded to Mr. Brooks for Drawings submitted under the motto "*Spes.*"

The INSTITUTE MEDAL and £5. 5s. - - - - - - G. H. SHACKLE.
Extra Prize: A MEDAL OF MERIT - - - - - - FRED. PINCHES.
Extra Prize: A Certificate of HONOURABLE MENTION - - B. PRIESTLEY SHIRES.

*** The INSTITUTE SILVER MEDAL and £5. 5s. were awarded to Mr. Shackle for measured Drawings illustrating Fountains Abbey, submitted under the motto "*Work and Hope.*"

In the same competition a MEDAL OF MERIT was awarded to Mr. Pinches for measured Drawings illustrating Broadwater Church, submitted under the motto "*Esperanza.*"

A Certificate of HONOURABLE MENTION was awarded to Mr. Shires for measured Drawings illustrating Markenfeld Hall, submitted under the motto "*Pupil.*"

The PUGIN TRAVELLING STUDENTSHIP - - - - - - G. W. BROWNE.
Extra Prize: The SHARPE Prize of £10. - - - W. J. N. MILLARD.
Extra Prize: A MEDAL of MERIT - - - - - - SYDNEY VACHER.

*** After a careful examination of the Drawings, Sketches, and Testimonials submitted by eight Candidates for the Pugin Travelling Studentship of 1878, the Council of the Institute elected Mr. George W. Browne. The Council had great pleasure in observing the high standard of excellence maintained by Competitors for the Studentship, and they determined to award a Prize of £10. out of the "Sharpe Donation" Fund to Mr. W. J. N. Millard, and a MEDAL OF MERIT to Mr. Sydney Vacher, in recognition of the skill displayed in the drawings submitted by them as Candidates for the Studentship.

The following letter having been read by the Hon. Secretary, the proceedings of the Conference commenced:—

SOCIÉTÉ CENTRALE DES ARCHITECTES.

Fondée en 1840, *Déclarée d'Utilité Publique en* 1865,

QUAI DE L'HORLOGE, N° 23, PARIS, *le* 29 *Mai,* 1878.

A Monsieur CHARLES BARRY,

Président de l'Institut Royal des Architectes Britanniques.

MONSIEUR ET HONORÉ PRÉSIDENT,

La Société Centrale des Architectes étant dans le désir de se faire représenter à la CONFÉRENCE GÉNÉRALE qui doit s'ouvrir à Londres le 3 Juin 1878, a désigné Monsieur CHARLES LUCAS, Secrétaire-rédacteur, pour assister à cette Conférence et lui en rendre compte.

Nous vous prions donc, Monsieur et honoré Président, de vouloir bien considérer Monsieur CHARLES LUCAS comme Délégué de la Société Centrale, et de lui communiquer, à ce titre, tous les documents de nature à l'aider dans sa mission.

Veuillez agréer, Monsieur et honoré Président, l'assurance de notre considération la plus distinguée.

Pour le Secrétaire-principal,
Le Secrétaire-adjoint,
E. CERNESSON.

Pour le Président, Membre de l'Institut,
Le Vice-Président,
EDMOND DE JOLY.

THE PRESIDENT'S ADDRESS.

GENTLEMEN,

I do not think it would be in good taste—when we have the promise of a Paper from one among our distinguished band of Honorary Associates, Mr. Armitage,—to detain you long with words of mine; but it seems to be considered my duty in some formal way to open the Conference with an Address. I cannot I think do so better than by bidding a hearty welcome, in the name of the London resident Members, to those of their brethren who have taken the trouble, at no small sacrifice, I am well aware, of time and money, to come among us on this occasion.

It has been well said somewhere that, if this Institute is an earnest body, if it indeed represents and numbers among its Members *British Architects*, these Conferences will become a necessity of its existence as well I hope as means for affording pleasure to all—and information to all. Since the last Conference in 1876 the Institute has passed through more than one organic change. I fully trust and believe, as I hope you all do, that those changes have added to its vitality and vigour, and have in some measure better enabled it to assert and maintain the interests of the profession—interests which I can never believe are diverse from, or opposed to, the interests of the public.

It is impossible, I think, to believe that these Meetings cannot do good among us, or that men to whom professional life and labour is a very earnest matter indeed, can meet each other as they have here the opportunity of doing, without gaining knowledge of much importance to them in their work. And what is in my opinion of much more value, they can hardly be brought together in friendly personal conference for a week without a lasting impression being made on the irminds how much better it is for themselves—for their art and for their clients—to be united rather than divided. And surely it is well for our members, now a rapidly increasing number—and it would be well for those architects of position who still, to my surprise, remain outside our Society—to be able all to feel that there is in England at least one organised body to represent them in the world; to which they can appeal when in difficulty; and which can speak with authority, to correct errors of public judgment, and to take a stand, if need be, in asserting the rights, interests, and honour of our profession.

An anxious Committee, as on former occasions, has worked hard to promote the success of this Conference in obtaining communications which will be brought before the Meetings in this room, and which I cannot doubt will produce discussion of interest to all.

In the selection of the Papers to be read here before you, I think that the Committee have exercised a sound judgment in including subjects of practical working interest to architects; while the Paper now to be read deals with the artistic functions of an Architect, the concluding Papers on Friday next will appeal to him as Antiquary and Archæologist.

Arrangements have also been made, as will be seen by reference to the Conference Programme, to occupy a portion of each day with visits to noble collections of pictorial Art, and to Modern Architectural works in progress, which are of the greatest interest; and which latter we may perhaps dare to hope may not be deemed without merit by succeeding generations

Let me then express a hope, present I am sure to the minds of all here, that this Meeting may add its impulse to the promotion of that feeling of brotherhood —of integrity and honour—without which no real progress can be made, and no personal happiness can long endure.

The President then called upon Mr. ARMITAGE to read his Paper on "Mural Painting."

MURAL PAINTING.

By EDWARD ARMITAGE, R.A., Hon. Associate.

IT APPEARS to me that the election of a considerable number of painters into your body should not be looked upon merely as a graceful compliment paid to a sister Art, but also as a means of promoting a better understanding between the members of the two professions. By the words "better understanding," I mean more frequent and more cordial co-operation. It is with a view towards this end that I have written a short Paper on the possible revival of the art of mural painting in England. The word "revival" is hardly suitable, as this branch of the art has never flourished in England. We will therefore replace it by the word "birth."

Having carefully considered this subject from all points of view, I have come to the conclusion that there are three principal causes which impede the growth of this the noblest branch of our profession :—

First.—The enormous cost of modern high class work.

Secondly.—The want of harmony between the work of the architect and the painter.

Thirdly.—The perishable or unsatisfactory nature of the materials generally used.

I propose to examine these three causes *seriatim* and to offer suggestions for their removal. First, as to cost :—I need hardly apologize in addressing practical men for introducing this very

important element into the question to be discussed. Æsthetic laymen may rave (as they did at the Antwerp Congress of last year) about Art being a religion, a subtle essence, a priceless gem, which it is a profanation to associate with any miserable question of money. All this may be very poetical but it is not practical, and can lead to nothing. Let us therefore take the bull by the horns and frankly examine the question of cost. Mural painting of a very high class need not be enormously expensive, if artists would only bear in mind what is the kind of work required. They too often forget that the qualities of high finish, chiaroscuro, richness and depth of colouring, so highly prized in an easel picture, are not only unnecessary but actually detrimental to mural painting. They often labour at details or subtleties of modelling which take up a great deal of time but are really of no value for decorative purposes. Time is money, and hence a work which takes an artist two years to complete will be very expensive, but if he could make up his mind to finish it in six months, it might be done (and would probably be better done) for one-fourth of the money. The question of cost is also closely connected with the nature of the subjects to be painted. Most of the frescos and wasserglas paintings in the Palace of Westminster are not properly decorative works, but rather a series of gallery pictures executed with water instead of oil, and an elaborate treatment was almost imposed on the artists by the nature of the subjects. Whenever passages from English History and kindred subjects are required to be illustrated, the work must always partake more or less of easel oil painting, especially where the panels are close to the eye. On the other hand, ceilings, spandrils of arches, friezes, &c., can be treated in a strictly decorative style. Good composition, firm correct outlines, filled in with flat tints of harmonious colour, is really all that is necessary, and it is possible for this kind of painting to be done rapidly and at small cost. It is obviously impossible to fix a tariff for artistic mural painting, but some step in this direction may be made by an examination of the sums paid abroad to distinguished artists for their work. If we divide the price paid to Delaroche for the Hemicycle by the number of square yards the work contains, we find the cost to have been about £30. per square yard, and if we make the same calculation in respect to Flandrin's frieze we find that the work was done for less than £22. a square yard. Delaroche's work can hardly be called decorative. It is an elaborately finished oil painting, but Flandrin's may be taken as a fair specimen of decorative painting of the very highest class. Where the panel to be painted is small, and where the figures are required to be less than life-size, the artist would naturally require a higher rate of remuneration, but after taking this into consideration, and after making every allowance for our extravagant age, I think that no mural painting ought to cost more than £50. a square yard, and that a great deal of effective and good work might be done for less than half that price. I am speaking of fairly remunerative prices; of course, it has happened, and will often happen again, that an artist may undertake an important work for the sake of increasing his reputation, or he may be influenced by other motives which may induce him to accept a mere nominal sum; but it is clear that these cases must always be exceptional, and cannot properly enter into our calculation of cost.

I have entered into these ignoble details because I wish to correct the general impression that mural painting of a high class must be always very expensive. It may be so *now*, but that is because so little of it is done in this country. There is no demand and therefore no supply; but if architects and their employers would open out a fair prospect for the practice of mural figure painting, I have no doubt but that painters would be found who would (like certain artists of the Continent) devote themselves to this branch of the profession. It is not sufficient that the artist should be well qualified for the work. He ought to have at his command a staff of trustworthy pupils or assistants. These are not improvised at a moment's notice, and without their co-operation mural painting as a rule

would be profitless work. No artist can expect to make as large an income by decorating buildings as he would by painting popular pictures. What Dr. Johnson called "the potentiality of becoming rich beyond the dreams of avarice" is out of his power. If the speedy acquisition of a large fortune be denied the mural painter, on the other hand he is saved from many of the minor annoyances to which the painter of easel pictures is exposed. His work is not relegated to the gallery or dining-room of some so-called patron of the art, to re-appear at intervals at Christie's sale rooms, or very possibly left on his hands without finding a purchaser at all. He is independent of the dealers and the commercial element in art. He is beyond the range of the annual attacks of Fine Art critics, whose small stings are really a cause of great annoyance to thin-skinned painters. He has not to flatter or please his sitters, nor to paint "pot-boilers" for the market. Finally, he is educating public taste, and therefore benefiting his country in a more direct manner than the successful portrait, genre, or landscape painter.

If we now turn to the second cause I have specified, viz., the want of *entente cordiale* between the architect and the painter, I am afraid we shall here find faults on both sides. The architect is too apt to think of nothing but his own share of the work. He neglects to leave convenient and well-lighted wall spaces for the painter. No artist of any standing will care about having his work relegated to a dark corner, or overpowered by stained glass and a profusion of late Gothic details. Again, the architect sometimes expects the painter to adopt the quaint composition and uncouth drawing of the 13th or 14th centuries as being more in keeping with the style of the building. If the painter happens to belong to a certain school, this obligation may be congenial to him, but generally speaking it is not, and hence a fertile source of disagreement between the architect and painter. On the other hand the painter often forgets that his work is ancillary to the architect's. In an easel picture he chooses his frame to suit the painting, but here he must reverse the process and suit the painting to the frame, the frame being the surrounding building. He must regulate the size of his figures, his light and shade, his perspective, all the elements in short of his work, solely with reference to the site it is to occupy. To neglect this is antagonistic to all good work. The architect and the painter should be in complete harmony like the violin and alto in an orchestra. Where they vie with each other as to who shall attract the most attention the result is fatal.

I will now consider the third impediment to the practice of mural painting, viz., the perishable and unsatisfactory nature of the materials generally used. Real fresco painting has been a complete failure in England as far as durability is concerned. Of this there can be no doubt, but opinions differ as to the cause of this failure. Impure colours, the omnipresent gas, the humidity of the climate, have all been assigned as reasons for the premature decay of our frescos, but from my own experience I should say that the real cause lay in the bad quality of the lime and sand used in the composition of the mortar. Immense pains were taken at Westminster Palace to get the oldest possible slaked lime procurable, and hogsheads of this curious old lime were imported from Munich. It was kept in tanks in the crypt of the Palace, was watered and skimmed from year's end to year's end, until at last it almost ceased to have any of the adhesive, cohesive and caustic properties which are indispensable to making good mortar. The sand, again, was a great deal too soft to the touch, and the consequence was that the mortar or intonaco was not sufficiently binding and could neither fix the colours properly nor even consolidate itself. This mania for old worn out lime has been the bane of fresco painting in England, and it is probable that no more experiments will be made in this direction. Ordinary oil painting is notoriously unsuitable for mural work, but if an absorbent ground be used (that is a ground prepared with size instead of oil) many of the objections to oil-painting are removed at once. I am engaged at present on the cartoons for some panels to be let in to a reredos

in a modern church. These panels are of slate (about 6 ft. by 4), and their surface is being prepared by my colourman in exactly the same way that an absorbent canvas is primed. I shall use oil colours with a little wax dissolved in the medium, and as the light is good, I fully expect thus to obviate all the inconveniences connected with ordinary oil painting.

There remain wax-painting (*peinture à la cire*), and silica or wasserglas. Until quite recently, I did not think much of either of these methods. The wax-paintings in the Paris churches, however great their artistic merit may be, do not harmonize with the surrounding building as real fresco would. They look like rather dull oil pictures, and have not the charming decorative properties of fresco or mosaic. The same may be said of Kaulbach's wasserglas paintings at Berlin.

About six weeks ago I went to Ypres and Courtrai to see the modern mural paintings which have been executed there, and I came back quite a convert to both methods employed. The wax-paintings of Pauwels at Ypres are immediately opposite, and on the same level, with a strong glaring light, but they are as perfectly *seen* as if they were water-colour or fresco. They are totally different in appearance from any wax-painting I ever saw. The same good qualities are very striking in Swertz's wasserglas paintings at Courtrai. His work at Ypres, and that of the Belgian Guffens, may be equally satisfactory; but the light is a side light, and does not therefore test the fitness of the material for mural work in so severe a manner.

At Courtrai I cross-examined the man who assisted the artist in the mechanical operation of applying the silica. It would be out of place here for me to enter into professional details, particularly as my only authority in the matter was the assistant; but I may say that the artist has a method of his own, the result of which seems to me most admirable.

I do not think there can be a doubt of the durability either of Pauwels's wax-painting or of Swertz's silica method. Some of the work has been done six years and there is not the faintest trace of bloom or decay of any kind. Besides, the wax method has been known and practised for more than forty years in Paris, and the wasserglas for more than twenty-five in Germany. These modern Belgian works, of which I have been speaking, have not been executed with a new material, and there is nothing whatever in the improvements introduced by the artists which would affect their durability. The processes are no secret; and it appears to me that the problem of replacing fresco by some more permanent but equally suitable method has been solved.

To recapitulate briefly what I have said, I consider that to implant and cultivate in England a taste for mural painting, it would be necessary—

1st. For the painters to be satisfied with moderate remuneration.

2ndly. For the architect and painter to consider themselves as joint artificers in the same piece of work.

3rdly. For either of the new methods recently adopted in Belgium to be employed.

The subject is one in which I have always taken a great interest, and I think that the time is rapidly approaching when it will interest others besides myself. The strong Puritanical prejudice against figure-painting in churches is being greatly mollified, and there are symptoms that corporate bodies are beginning to wish for something better than bad portraits of Royal Dukes in their halls. On the other hand we have, both at the Academy and South Kensington, a sounder and more thorough system of teaching than formerly; and it would not be impossible to find, amongst the more advanced students, that gratuitous, or nearly gratuitous assistance, without which mural painting on a large scale is almost impracticable. These students would be glad to serve a kind of apprenticeship, and thus to prepare themselves for undertaking similar work.

For this happy state of things to come about, however, it is necessary that architects should

take the initiative. They have for many years been successfully engaged on works of restoration. Colour has been introduced pretty freely, and no architect would now be satisfied with the whitewash of the Georgian period. Let them go a step further and call in the aid of the best and highest art which the country can produce, instead of employing men whose position in relation to painting and sculpture is analogous to that of the commonest builder to architecture. Let them patronise painters of original talent, but who at the same time are gifted with common sense; men who will neither degrade their art by imitating archaic deformity, nor shock the proprieties by the introduction of sham classicism into a mediæval building. Mistakes in the choice of a painter would doubtless be made, just as mistakes are sometimes made in the choice of an architect; but the general system would be sound, and would, I think, lead to noble results. The sharp, hard lines which sever the three professions would become softened; sculptors and painters would know a little more about architecture; and architects would learn something of the sister arts.

I hail with satisfaction the introduction of the thin end of the wedge by the admission of painters and sculptors as Honorary Associates of the Institute. It rests with the leading members of your profession to drive the wedge home.

The PRESIDENT.—It is hardly necessary for me to call upon anybody to speak upon so interesting a subject as that which we have before us,—interesting as it must be to all in this room,—and conveying suggestions which can hardly fail to produce some effect. But it will occur to many, no doubt, that to the gold medallist of the year this subject must have special interest. In the Town Hall of Manchester mural painting is to be largely employed, and I venture to think Mr. Waterhouse must have been more than usually interested in the subject offered for Discussion.

Mr. WATERHOUSE, A.R.A., Member of Council.—I thought I had said quite enough to-night without obtruding myself on your attention again, but as the President has asked me to say a few words, I have pleasure in doing so, if only to say that I have listened to this Paper with the greatest possible interest; for I have endeavoured in Manchester, as you, Sir, have hinted, to arrange and prepare the walls of its Town Hall for mural paintings. At the outset I must confess to one mistake there. I have designed the panels in some cases too long in proportion to their height, and consequently those artists who have looked at them have complained of them as expensive panels to fill, involving as they do a greater number of figures than if they had been higher in proportion to their length. When I found the Corporation disposed to consider seriously the question of these mural decorations, I visited the Low Countries to examine the works of which Mr. Armitage has spoken, and I was very much delighted, particularly at Courtrai and Ypres, with the noble works of MM. Guffens and Swertz. These artists appear to have always worked together, and certainly they have solved the problem of how to use water-glass successfully. I have found, however, hitherto great difficulty—almost insuperable difficulty—in persuading English artists to adopt the water-glass method; so that it is most satisfactory to me to hear Mr. Armitage's testimony in its favour. It has been tried, as we know, on a gigantic scale in the Royal Gallery at the Houses of Parliament, but the pictures have given such trouble in the first place to their great painter himself, and afterwards to those who came to restore them, that I can understand the desire of painters to avoid this method. After what Mr. Armitage has just told us, I suppose I must confess to another mistake. At the instance of an artist who has given a great deal of attention to the matter, I was induced to prepare the panels of the Great Hall in Manchester with some of the very old lime spoken of. I did not know that it came from Munich, but I was told that some of it had been preserved from the first days of the Houses of Parliament. The old lime was mixed with ground marble, and

I am bound to say it has resulted so far in the hardest of plaster, adhering with the firmest of grips to the wall. Coming as these pictures will in the window recesses and below the sills, the wall itself is hollow, 4½ inches thick, with a space between it and the main wall of 3 or 4 inches for the passage of the warm air to heat the room, so that I feel quite sure in this case, at any rate, the pictures will not have a damp back ground. Twelve subjects are to be painted in the Great Hall by Mr. Madox Brown, and Mr. F. Shields, illustrating the history of the city from the introduction of Christianity to the present time. The cost of the work is estimated at about £30 per square yard, and probably would not have been so much, but for the circumstances to which I have referred.

Mr. ARMITAGE, R.A., Hon. Associate.—I may say at once I forgot to mention that the Belgian pictures to which I have alluded are painted on the wall itself. It is a brick wall, prepared in the usual way—first a rough coat of mortar, and then a finer coat of the same kind of mortar. The mortar is allowed to get thoroughly dried and the colours are placed upon it. The pictures are painted immediately on the wall, not on canvas but on the plaster.

Mr. C. J. PHIPPS, F.S.A., Fellow.—As to the question of cost, I am at liberty to state that I have paid Mr. Holiday and Mr. Marks each £200 for a frieze 30 feet long by 6 feet high, which would come to about £10 per square yard; to Mr. Albert Moore, for the same sized frieze, I have paid £15 a square yard. In each case the figures do not exceed twelve in number.

Mr. JOSEPH CLARKE, F.S.A., Member of Council.—In St. Alban's Church at Rochdale, there is a very fine specimen of chancel painting by Albert Moore, to be seen, which I believe is as perfect now, with the exception of dust, as it was when finished. The wall is of ordinary plaster, not lined with brick. The old plaster was taken down and a new coating put on by almost local workmen in a very rough way; but, as I said, the pictures are almost as perfect as when they were done; £700 was paid for the painting of that chancel, and it is most effectively and artistically executed.

Mr. G. E. STREET, R.A., Vice-President.—My friend on my right has, I fear, preferred an indictment against the architects of the present day; and I think something ought to be said in defence of them as against painters in this matter of wall-painting. I will, in the first place, convict my friend out of his own mouth. He tells us that the frescoes in the Houses of Parliament are unsatisfactory in their mode of treatment with regard to the architecture and in final effect. But surely that was no fault of the architect. I can myself conceive no reason why perfect effects should not be produced in frescoes, particularly where competent and distinguished men are employed as the painters; but in this case they have simply adopted on the walls of a building the sort of work which they are in the habit of doing upon canvas. That is the fault of the artists themselves, and in no degree the consequence of painting in a Gothic building. Any architect who has tried to employ the most distinguished men amongst painters will find his experience very much the same. In the first place, I am bound to say that painters are too often disposed to carry out what pleases them best; and they will seldom work with the architect so as to make their mural paintings harmonize with the architecture. In fact, they make no attempt to study architecture, and but very little to study those examples of early Italian art in which wall-painting was carried to perfection before the middle of the sixteenth century; and the architect who tries to introduce this form of decoration, and who has studied carefully, as some of us have, those admirably decorated old Italian buildings, begins almost to despair. Besides the difficulties Mr. Armitage has mentioned, there is one to which he has not alluded, and which, I fancy, is the greatest difficulty of all. Almost all my work in which I have had the power of introducing coloured decoration has laid in out-of-the-way country places. It is almost impossible to get a painter to forego the charms of his studio-life in London, in order to devote himself for any length of time to work upon the walls of a building in a country town or village; and the

consequence is, we are obliged to go to inferior men, though they are not so inferior as Mr. Armitage supposes. This is a real difficulty. If it could be overcome, the other questions on which Mr. Armitage has spoken would have to be settled. And here I must dispute what he says with regard to the combination of stained glass and mural painting. I cannot understand why painter's work of the present day should not, if its treatment and adaptation to its place are perfectly right and good, be so devised as to make it unnecessary to raise any critical objection with regard to its combination with the stained glass, which produces such good and brilliant effects, and of which we are all so fond. There are examples of mural paintings abroad of supreme interest, all of which are lighted through the most brilliant stained glass—Sta. Croce, Florence, supplies admirable examples—and the reason why it did not do harm to the wall paintings was, that the colours introduced into the pictures were extremely simple, and consequently they depended more upon definiteness of outline and brightness of colouring than on light and shade. I go on from this point to suggest whether Mr. Armitage, and those who take a similar interest in this subject, should not consider how far it might be possible, when they have been able to get younger men trained to assist them, to adopt such a system of design, and such a process as would be capable of repetition by other hands than those of the master in out-of-the-way places. That is one of the real difficulties of the case and one of the reasons why the more elaborate works, executed in cities and large towns, cannot be repeated in places less important. That was, however, done largely in a period with which my friend does not sympathise so much as I do, namely, the Middle Ages. In those days every building throughout the land had some coloured decorations on its walls. They were usually rude, but their rudeness may well be pardoned. We have illustrations, in the Norwich School of Painters, of work done at head quarters being transferred to various places in the diocese,—seen from Norwich even into country villages; and the same universality of wall-painting was seen in Italy, not only in those earlier days but equally in a later period than the Middle Ages, when painting was introduced as we all know on almost every wall in every church; and whereas in England now-a-days the only great centre of painting is London, in Italy, within a district no larger than our own country, there were any number of centres, each with its own school and group of painters, and it was possible to get work done in country districts which we cannot now get done here. As to the cost of the work, I am amazed to hear some of the statements made as to the cost in one or two cases. The work must virtually have been done gratuitously when you speak—as Mr. Phipps does—of such a price as £ 2. per square foot; that being hardly the price one pays for stained glass. If we could get work done here at that price we should have all our walls painted in no time. But it would be unreasonable to ask for this; and I believe that, when the man and the mode are found, the cost of the work will not be the impediment. Mr. Armitage, I am sure, will thank me for stating my objections rather than assenting to all he has said; and so I shall venture to say a few words more. As to architects not preparing proper square and well-lighted spaces for paintings, I can only say that I know of a great many cases in which such spaces have been reserved for paintings. I am glad to say that I am reserving such spaces at the present day in many cases, and especially in the new Law Courts; but it is rather more difficult than Mr. Armitage sees at once to say, as soon as spaces are prepared, that we must engage the first eminent painter we meet to paint our walls. We must, I venture to say, first of all have a school of painters who have devoted themselves to the subject, and who have shown by their works that they have studied it; and it lays with painters to prove by their works how walls should be decorated in harmony with the architecture, rather than to content themselves by saying that it is the architect's business to make his walls of such a shape as to suit any paintings they may adopt. Mr. Armitage has protested against Gothic traceries, but I cannot, I

confess, see what the question of Gothic tracery in some parts of a building has to do with decorative painting of the walls in other parts. But there are other modes of introducing figure painting in buildings; which well deserve a few moments' consideration. The chapel of Marlborough College has been decorated with a series of works by Mr. Spencer Stanhope. These are painted on panel and enclosed in well-designed frames, and fixed between the windows all round the chapel. Such an arrangement seems particularly happy; and it leads me to observe that this is a way which I, as an architect, find necessary, when I wish to introduce paintings that can be done in the artist's studio, and transferred to the country and attached to the walls. I have myself had a good many done, some of considerable interest and value; and there are some well known examples, such as Mr. Burne Jones's painting over the altar of St. Paul's Church at Brighton; another, of Mr. Rossetti's, at Llandaff. Mr. Armitage has dwelt a good deal on the advantages of arranging figure subjects in the shape of friezes. Well, I am afraid that I must say that this sort of work would involve great similarity in treatment, and in the subjects which could be introduced. We should not always be happy in looking at processional subjects; and again, though it is very true that spandril decoration is very necessary and very decorative, what you really want, if your paintings are to interest people, are large square spaces, in which the artist can have free play for subjects which, in a civil building, may well be of historical interest, and in churches of a sacred character; and the more story there is in them the better. Mr. Armitage thinks such subjects would be more expensive, as giving more trouble to the artist, but, unless you make your subjects illustrative of the history, poetry, or religion of the country and of the purposes of the building, you will never persuade people to care much about them. For some years now a good deal has been done in a direction on which Mr. Armitage has not touched—I mean the introduction of pictorial decoration in glass mosaic. We have the best materials; and I venture to say that some of Mr. Clayton's designs for such work are by no means to be despised. The mosaics in the Albert Memorial are evidences of this. He has taken the trouble to understand the way in which mosaic decoration ought to be done, and has confined himself, more than most designers, to what is suitable, though even here with hardly sufficient attention to what old examples of mosaic decoration teach. If you go from the very earliest mosaics of Ravenna, or Rome, or Venice, to those of later date, you are struck with the infinite superiority of the earlier work in the way of decoration and the telling of history. No where can you see this better than in St. Mark at Venice, where the stern simplicity of the early artists is incomparably more successful than the attempt of the 17th and 18th century mosaicists to show how cleverly they could draw their draperies, and how much they thought of light and shade. It is necessary, in fine, that architects should try to keep the painters, when they come to deal with our walls, from revelling too much in the modern development of easel painting. We do not want chiaroscuro, or pictorial effects of the common kind, and we do want simplicity of design and brightness of colour in order that their works may be both intelligible and decorative. If you have a painter to decorate the walls of a church, Mr. Armitage's notes on the processes which he may adopt are of much value; but he has omitted all reference to one of the best of all,—namely, the old mode of painting on walls in distemper. I am not sure, indeed, that this is not the true mode; most of our old wall pictures in England are in tempera, as also are most of those which are commonly called frescoes in Italy before the 16th century. Distemper is so good a material that, even without any ultimate setting with water-glass, you find examples, as at Rievaulx Abbey, of external walls decorated in that way in the 13th century, and exposed for 300 years to the weather and still visible, and therefore it cannot be a bad material; but set with water-glass for external decoration of walls it is likely, in my opinion, to be no more fugitive than fresco, whilst it is far more

easily managed. Mr. Watts's large fresco at St. James the Less, Westminster, seems to me to be a good illustration of the danger of using that process. It is painted on an absolutely dry wall; it has been painted about twenty years, and it is now far less visible and intelligible than it was when first painted. Indeed, my own experience of frescoes in this and other countries is, that they are, as a rule, most unsatisfactory. I hardly know any fresco which has been painted and finished in pure fresco: most of them have been touched up in distemper. Mr. Dyce's work in All Saints, Margaret Street, in many respects a most admirable and noble work, was painted in fresco, but I believe from the first, and by Mr. Dyce himself, touched with distemper.

Mr. ARMITAGE.—It was falling to pieces, and I had to repair it.

Mr. STREET.—So I thought: and unless a man can do his work decidedly and finally, though in small portions at a time, he is unfit to work in fresco, for he is almost sure to see something that wants to be done, and to yield to the temptation, so that in the end you can hardly look at a fresco in which you have not two kinds of work—fresco and tempera mixed together, with very bad effect. Rare, indeed, even in Italy, are the examples of frescoes which are really bright and decorative in their design. As a rule they are heavy and gloomy, and must be looked at with interest for their own merits only, and not for their good effect upon the buildings whose walls they cover. Before I sit down, it occurs to me to say how much I was struck, three or four years ago, at seeing the effect of painting all over the outside of one of the great houses—that of Fugger, the famous banker, in Augsburg. The effect was most brilliant, though the house itself was quite uninteresting; and I wish some of our painters could get a chance of decorating, in a similar fashion, some of the fronts of our London houses with some colour that would both stand and wash. Most of you will remember the beautiful effects of colours applied in this way on the walls of Italian towns, as, for instance, in Brescia and Florence. There is still another mode of permanent decoration, in which the designs are made by an artist and then executed on tiles, and the effect of such work might be remarkably good if done by superior men, who really tried to adapt their work to the material. Mr. Burne Jones, who shows his artistic power by the readiness and zeal with which he devotes himself to designing in this spirit, has done some very charming designs for tiles. Many years ago Mr. Morris painted for me some admirable figures for the chancel walls of Bournemouth Church, and his success there makes me astonished that such work is not more commonly done. It is an absolutely permanent decoration. It can be cleaned easily, and it may all be done under the artist's own eye in London.

Mr. AITCHISON, B.A., Fellow.—I did not come here prepared to say anything upon this subject, because I thought that such an artist as Mr. Armitage would say everything that could be said. At present we are in that position that we may look forward to getting the masterpieces of the painter's art in combination with our own work. I am inclined to differ from the remarks which have fallen from some of the eminent men of our profession. I think where we can have the work of distinguished artists to decorate our buildings, we ought to consider their work, as far as the decoration is concerned, the principal thing to be regarded; and we should, when we have secured elegant proportion and effective light and shade, prepare our buildings for that purpose. We should look upon our work as merely the crust in which the jam is to be put. I think at the present day we must consider the painter holds the palm of all the visual fine arts, and therefore to him should be given the place of honour. I think at all times it must have been so: for what says the poet—

"The proper study of mankind is man;"

and that, I believe, has always been true. Wherever human beings are represented, there is the central interest. It is possible we have not in the present day artists who can vie with the first men

of Greece and Italy; but I believe that, in Europe,—particularly in France and England—we shall find men only second to them in eminence. It has been, I may say, my fondest hope to see a great deal more of this beautiful art exhibited in our public and private buildings. In what I have done, and wherever I have had the opportunity, I have always sought to have the pictorial decoration done by artists of the greatest eminence; and I am proud to say some of the most distinguished men have been kind enough almost to give their work for that purpose. When I was at Liverpool, I endeavoured to arouse the desire of its princely merchants to have the wall space of that magnificent portico of St. George's Hall, opposite the Lime Street Station, covered with figure pictures in mosaic; for I am afraid that no fresco would withstand that atmosphere. I cannot agree with Mr. Street about the frescoes of Italy: some of them are most lovely in colour, and the reverse of gloomy and heavy. I speak particularly of Pinturicchio's ceiling of the library at the Cathedral at Siena, which has the appearance of having been done yesterday, and to my eye was most charming in colour. Again, some of the Stanze of the Vatican are covered with Raphael's frescoes, and some of these are the most lovely pieces of colouring I have ever seen. The objections to modern fresco are, the difficulty of preparing the ground; the question whether it will stand the smoke, dust and gases with which the atmosphere of London is filled; and the possibility of getting harmonious colours, for were the colours no better than at Munich, we had better have them in chiaroscuro. I do ardently hope now that we have so many distinguished painters amongst us, we may see some of their work on our public buildings.

Mr. HOLIDAY, Hon. Associate.—As a painter perhaps I may be allowed to differ from Mr. Aitchison. He regards the building as the mere case or framing for the painting. I can imagine a building being so constructed that the architect may have in his eye from the beginning an elaborate series of painted decorations such as is seen in the Arena Chapel at Padua. The architect there seems to have left to the painter the main decoration of the structure, that of an architectural character being of the simplest nature. But this is an exceptional case, and I think painters could not expect that architects should cede to them the first place wherever mural painting is introduced. In connection with the question of cost, the Arena Chapel may perhaps be regarded as an illustration of what can be done by the one art without much assistance from the other. The two are hardly necessary in equal profusion in the same room; where there is no painting our decoration must be drawn from the other source. I agree with what Mr. Armitage has said about materials. I have found that in the use of wax the effect of a dull oil painting may be avoided by having a ground prepared with sand to give the granular surface of fresco. This prevents the tendency of the wax to give too smooth a surface which is not pleasing on the wall. In Italy, where I have examined the mural pictures of Giotto and others, they appear to be painted in fresco with one or two simple colours and painted over in tempera afterwards. I look upon tempera as an extremely desirable material and more brilliant than wax, which requires great care in colour not to get a dull effect, and it appears from what has been said with regard to the church at Rochdale that distemper is safe and durable. I have had no personal experience of water-glass, but I am glad to hear from Mr. Armitage that it is satisfactory.

Mr. ARMITAGE.—As to the question of cost, instances have been quoted of mural paintings being executed for £10 or £15 a square yard. Such prices are conceivable only on the hypothesis that the background is large in proportion to the space covered by the figures. With respect to the water-glass paintings in the Westminster Palace, I believe that their decay is due entirely to an improper use of the silica—the fluid having been frequently applied during the progress of the works instead of being used as a kind of varnish when the painting was completely finished; moreover it

was frequently used as a vehicle for painting, instead of a fixing liquid to a finished work. The Berlin water-glass paintings, executed twenty-five years ago, are I believe still in very good condition. I am glad to hear such a good account of tempera; I was afraid that it would have been more liable to be affected by damp than it seems to have been in the cases mentioned. Of course, if its endurance can be ensured, nothing can be said against it, and its brightness and facility of execution are greatly in its favour. Mr. Street has somewhat misconceived my observations as to the relations of the architect and the painter, for I took care to say that mural decoration should be ancillary to the work of the architect. In my opinion, the architect's is the principal work, and the painter ought to suit his work to the building. There should be no difficulty in that being done, for the architects of Gothic or Classic buildings will, if they are wise, employ artists whose predilections as to style are in harmony with their own. A principal point which architects and painters ought ever to bear in mind, when engaged on the same work, is that the work when finished is not to be *two* works, one of the architect and one of the painter, but *one* work, harmonious throughout, and the joint result of two artists working *con amore* to effect the same end,—the painter taking as much interest in the cornice and the other architectural features of the room as the architect takes in them, and the architect feeling as much interest in the painting as the painter himself.

The PRESIDENT, in concluding the Discussion, said that it was a pleasing part of the proceedings to return thanks to gentlemen who came to entertain and instruct. The Paper, as far as he remembered, was unique in character; the Discussion of it was the first example he called to mind where the architect and the painter had generously and fairly striven to yield to each other his proper function in works on which they were both employed. As among the first fruits of the new order of Honorary Associates, represented on this (the second) occasion in the person of a member of the Royal Academy, it was one of great consequence. It was another proof of the extreme value of the class of Members only recently inaugurated. The humourous illustration of Mr. Armitage, in the matter of price, seemed very much to the point. It was hardly possible to do more than arrive at the vaguest possible idea of what the price of a work of art ought to be. It was sufficient to know that works of art, not despicable in themselves, could be produced at the moderate price to which Mr. Armitage alluded. There was happily no difference between architects and painters in the opinion that mural painting should be more largely employed than at present, and in the desire to realise that he was sure the meeting joined. He had to ask the Members to thank Mr. Armitage most cordially for the Paper he had read.

Mr. STREET seconded the proposition, and joined sincerely in all that the President had said about the great advantage derived by architects from the opinions of men like Mr. Armitage.

The vote of thanks to Mr. Armitage having been carried by acclamation, the Meeting separated.

Royal Institute of British Architects.

GENERAL CONFERENCE, WEDNESDAY, JUNE 5th, 1878.

Professor LEWIS, F.S.A., Vice-President, in the Chair.

THE CORROSION OF IRON.

By PROFESSOR BARFF.

Mr. CHAIRMAN AND GENTLEMEN,

It has long appeared to me that the process which I have the honour to explain to you this evening must have considerable interest for the members of your profession, so that when I was sometime ago asked to read a Paper on it before your Institute I accepted the invitation readily and with pleasure.

Anything which will give you a new material adapted to construction or to the carrying out of ornamental design will, I am sure, command your earnest attention; and although the material of which I am going to speak is not new, still the process to which it may be submitted gives it the quality of remaining unchanged on its surface when exposed to atmospheric influences, and so prevents that decay which had, whenever it was used, to be checked for a time by applications interfering much with the beauty of the workmanship bestowed upon it, and which being but temporary had to be repeated to the still further detriment of its appearance. The galvanizing process interferes much with the colour of iron, giving it the appearance of zinc, the metal with which by that process it is coated; and although galvanizing arrests for a time the oxydation or rusting of the iron, still its protective influence, which is the result of a continuous chemical action, must under the most favourable circumstances come at last to an end. The zinc protects the iron because it is, what is called, electropositive to iron, or chemically more active, so that in the presence of moisture, and other influences existing in the air, the zinc is continually wasting away; by this wasting the iron is protected: so, though theoretically the iron will not begin to go till all the zinc is consumed—this is not the case in practice, for when the iron gets exposed by the zinc covering being removed it begins to rust; and the rust, spreading under the zinc, in time throws it off in flakes. This also is the case where enamels are used. The enamel gets broken off in places, and the rust, extending beneath it, throws it off from the surface of the iron. This may be seen in some of the tablets on which advertisements are exhibited along our railways; it is also well understood by those who use cooking utensils coated with enamel. I shall show later on that the process I recommend is not open to this objection, for the coating, if not perfect in any part, prevents nevertheless the lateral extension of rust, and so forms a protection against the destruction of the metal. I need say nothing about painting, varnishing or the application of hot oil, because you all know well of what brief duration is their protective influence. I will, however, mention, what you have no doubt observed, that some paints last longer than others, but that all are perishable.

The process, which I am now about to explain, does not consist in coating the surface of the iron with any applied substance, but in changing the iron itself by the addition of oxygen into an oxide which is not affected by atmospheric influences.

In order to make the matter clear to everyone it will perhaps be well for me to explain as simply as I can the agent employed in producing the effect, and the action which it exerts upon the iron. And here, Gentlemen, I trust you will pardon me if I appear to enter too minutely into details, and do not take for granted that you are all chemists. I do not in the least intend to imply that there are not many scientific men amongst you, but as I feel it to be my duty to thoroughly inform everyone as to what I have taken in hand to explain, I hope you will not blame me if my remarks appear to some to be rather tedious. The agent employed is superheated or dry steam. I am frequently asked how steam which is generated from water, which is wet, can be made dry. The three substances, water, ice and steam, are all chemically the same; they are of the same composition and are formed by the union of 16 parts by weight of oxygen, and 2 parts by weight of hydrogen. These gases when set free by the decomposition of either of these substances occupy certain measures or volumes; the 16 parts by weight of oxygen occupy one measure or volume, and the 2 parts of hydrogen occupy two volumes, each exactly the same as the volume of oxygen. If two measures of hydrogen and one of oxygen be put together, and be caused to unite, they will form water; if this water be formed at the temperature of 212 deg. Fah. or 100 deg. C., the volume of the steam formed will be the same as that of the hydrogen. When ice is heated it does not get warmer if it is at the temperature of 32 deg. Fah. or Zero C., but it melts, and when melted is water at the same temperature; also when water is heated to 212 deg. Fah. it gets no hotter however much it be heated, if the vessel which contains it is open to the air, but the additional heat converts it into steam at 212 deg. Fah. Now this steam being generated in contact with water takes up water in suspension along with it and is called saturated steam. If, however, a quantity of this saturated steam be heated by itself, and be allowed to expand, the water which is held in suspension is also converted into steam, so that if the presence of water be necessary to constitute wetness its absence will constitute dryness, and the steam in the first case—*i. e.* the saturated steam—will be called wet; and that in the second will be called dry. Now this dry steam can be heated to any temperature, by passing it through pipes heated to the desired temperature. Steam in the dry state is a colourless transparent gas, and when heated it expands at the same rate as other gases or nearly so. Steam is invisible, no one has ever seen steam. What we see and call steam is not steam, but condensed water vapour in a state of very fine division. All gases when they come in contact with water take it up and hold it in suspension. The warmer the gas the more water it will take up. This is easily seen in a hot-house or a wash-house; the air becomes highly charged with moisture, and this moisture is deposited as water on the cold windows, proving that as the air is cooled it holds less moisture in suspension; but at no time is the moisture visible in the air until it condenses. In operating upon iron with steam for forming the protecting coat the steam must be dry; *i. e.* it must hold no water-vapour in suspension, for, if it do, another oxide of iron is formed as well, which is what is called red rust. There are certain metals which decompose water, some at the ordinary temperature of the air, others at higher temperatures, and some metals do not decompose water at all. The way in which they decompose water is by taking from it its oxygen and setting free its hydrogen. Potassium and Sodium, and some other metals, decompose water at the ordinary temperature of the air, and these metals, uniting with the oxygen of the water, form what are called oxides, and hydrogen is set free. Thus potassium forms its oxide potash, and sodium soda. In these cases, however, some of the hydrogen, that is, one half remains with the oxide forming a hydrate, but I need not here do more than mention this. Iron decomposes water or steam at a high temperature—*i. e.* at a red heat, all the oxygen of the steam unites with the iron, and all the hydrogen is set free. If the steam be in the saturated state when the iron is submitted

to its action I discovered that the oxide formed does not adhere firmly to the iron, but if the steam be superheated or dry, the oxide does adhere very closely to the iron. In this case it seems that the moist steam first forms the red oxide of iron, and this is reduced—by the hydrogen set free—to the metallic state, and is in a state of fine division; and this finely divided iron is then, by fresh steam, converted into the black oxide. Having passed through these changes it will manifestly have lost its bond, and although it adheres for a short time, it is before long thrown off, and rusting is then set up on the surface which it covered. All chemical actions take place in definite quantities. Iron unites with oxygen in several different proportions: for example 56 parts of iron unite with 16 parts by weight of oxygen, and what is called protoxide of iron, or ferrous oxide, is formed. Now this oxide is very unstable. In the presence of oxygen and moisture it is very rapidly changed into another oxide, 56 parts by weight of iron and 16 of oxygen—*i. e.* ferrous oxide unites with the same weight of ferrous oxide so that 2 (56) of iron, and 2 (16) of oxygen together unite with or take up another 16 parts by weight of oxygen—forming another oxide called peroxide of iron, or ferric oxide, and this is the substance known as iron rust. It seems clear that the first action of oxygen on iron is to form the ferrous oxide, and this, as I have explained, gets converted rapidly into ferric oxide. Now imagine the surface of a piece of iron in moist air to be thus coated, it will not be difficult to understand, that the entire oxygen which this ferrous oxide takes up to become ferric oxide is passed on to the iron beneath it, forming with it ferrous oxide; and that the first ferrous oxide formed takes up more oxygen and becomes ferric oxide again. This process goes on continuously till all the iron is in time converted into ferric oxide. The ferrous oxide then acts as a carrier of oxygen to the iron, causing it to be changed throughout its mass into oxide. Now this action does not take place with other metals which are used in building, because these metals do not form two oxides in the same way in which iron does. Take lead for example: it only forms one oxide by the direct action of oxygen upon it; and, when its surface is covered with oxide, no further change takes place, except that the oxide becomes converted into carbonate by the carbonic acid gas in the air.* The whole of the metal which is changed from the metallic state is changed in a short time, so that no further action goes on unless the coat formed be removed mechanically; hence it gives for ages protection to the lead beneath it. A similar action takes place with zinc, and also with copper. All these metals are known to last well when exposed to air if they be not attached to the place where they are applied by other metals which with them cause galvanic action. Besides the two oxides of iron which I have mentioned there are others, one only of which will need our attention: it is called the magnetic, or black oxide. It is supposed that this oxide is made up of the other two, viz., the protoxide and the peroxide, for, if we add together the weights of these oxides, we shall have 3 (56) parts by weight of iron and 4 (16) of oxygen; and this is the proportion in which these two elements unite together to form this black oxide.

Many experiments which I have performed tend to confirm this view of the constitution of magnetic oxide of iron, but I need not trouble you with a relation of them, as they are of more interest to chemists than they possibly can be to you; and they in no way bear on the industrial application of magnetic oxide to the arts. A piece of perfectly dry clean iron will not oxidise in dry air. Moisture is necessary to cause the oxygen of the air to unite with it; and whenever iron is exposed to moisture ferric or red oxide of iron is the result. But when iron is burned in *dry* air or oxygen, this red oxide is not formed: the black oxide is produced. If, however, an experiment be carelessly performed to illustrate this,—if the air or oxygen be not *dry*,—then some red oxide will be formed along with the black. The black magnetic oxide of iron is not affected by oxygen in the

* Lead when heated to a high temperature forms both oxides, but at ordinary temperatures only one.

presence of moisture, and thus it affords a protection to the iron upon which it is formed. Long before I brought my process to its present state, I felt that if I could make this oxide adhere firmly to iron, it would resist the ordinary rusting action; and when I showed my first specimens to scientific and practical men they expressed their opinion that the principle was correct. They felt sure that whatever difficulties might be encountered they could be overcome. And the difficulties have been great, for it has taken more than two years to bring the process into such a state that commercial men could regard it as of practical utility. When I read my Paper before the Society of Arts, on the 14th of February, 1877, Admiral Selwyn said, in the discussion which followed, that "in New Zealand you could find any quantity of this substance which had remained totally unchanged even by the action of salt water during all the centuries which had elapsed since the creation of the world." Nor have I ever met with anyone who knows anything about the subject who has the slightest doubt as to the enduring properties of the black oxide of iron. The only doubt I have ever heard expressed is whether this substance can be artificially formed so that its own particles will stick together and adhere firmly enough to the iron on which they are produced. I believe now that there is no doubt on this point, for many have proved it to be so hard that it will wear away a rasp before it can be removed from an iron surface.

I will now proceed to explain *how* the process is conducted. At first I used to allow water to pour down a pipe from a height of about 34 feet, into a coil consisting of some 80 feet of iron pipe of about 5-8ths inch bore. This pipe was contained in an iron cylinder, so arranged that a fire might be lighted in its centre, the flames of which could surround the pipe in order to make it red-hot through its entire length. The water was held back by a tap, and when the pipe was hot enough it was allowed to run into it—the water entering at the lower end of the coil. The water which first reached the red-hot pipe was converted into steam; this was driven on by that behind it; and so the steam, passing through the red-hot coil, became superheated as long as the coil was kept hot enough. The water was kept back by the force of the steam, so that it only entered a short distance; the steam thus generated and superheated was then conveyed into an ordinary glass painter's muffle, entering at the back. This muffle, to prevent the condensation of the steam and to raise the articles to be treated to a sufficiently high temperature, was heated by a fire in the ordinary way. After the muffle was charged, sufficient time was allowed for heating its contents; then the door was closed and luted with fire-clay, and the superheated steam was turned on. From four to six hours was the time to which the small articles there treated were exposed to the action of the superheated steam. These smaller specimens before you were exposed for about this time. Certain difficulties arose from this method of generating the steam. I need not tell you what they were, as I have now quite abandoned it. I may, however, mention one,—and that was, the liability of cooling the coil when the fire had to receive fresh coal. In this case the steam got wet, and red oxide was formed which, as I have already explained, interferes with the durability of the coating. To prevent this, too much care and constant watchfulness were required to render the process commercially successful. The apparatus I now employ consists (first) of an ordinary boiler, in which steam is generated, usually at a pressure of 40 lbs. to the inch. My boiler is a very strong one, as it is adapted to other experiments; one which is safe at 40 lbs. pressure is sufficiently strong for this work. From the boiler the steam passes into a tight iron box, where it parts with some of its moisture, for the steam is saturated; from this box it passes into the superheater at its original pressure. The superheater consists of two stacks of pipes placed in a furnace parallel to one another, with a space of about fifteen inches between them. These stacks are supported on dwarf walls of fire-brick, and are connected together so that the steam traverses the whole length of all the pipes, which is about 36 feet. The pipes are $1\frac{1}{2}$ in. bore, and are kept at a red heat, or even at a higher temperature; the

steam in its passage through them becomes superheated, and when it issues from the end it will set fire to wood. The end of the superheater pipe is connected with the back of a chamber built of fire-bricks; this chamber is 5 ft. long, 2 ft. 6 in. wide, and 1 ft. 6 in. high, arched at the top. Beneath it is a fire-place, and up its sides flues pass, so as to ensure its being uniformly heated; it is closed with an iron door, faced with fire tiles $1\frac{1}{4}$ in. thick, which is easily raised by a balance weight. When it is wished to work the process the fire is lighted beneath the chamber; and it is heated to a temperature of about 700 deg. or 800 deg. Fah. All this time the superheater is being raised to a proper temperature—that is, to a cherry red heat, and the steam is got up to 40 lbs. in the boiler. The chamber is then opened; the iron articles are placed in it, and kept there till the temperature rises again to from 700 deg. to 800 deg. Fah. The door is then luted with fire clay and the steam is let in gently, not with the full force that it has at a pressure of 40 lbs. The great object is to keep the chamber *full* of steam during the operation, and to effect this a *slight*, but a very *slight*, pressure is kept up; this is effected by having 7-8ths inch pipe placed at the upper part of the front of the chamber, close to the door. This pipe rises for about 2 ft. 6 in. vertically, and then bends down to beneath the fire-place of the superheater, where it discharges excess of steam and the hydrogen evolved in the operation. At the top of this exit pipe, before it begins to bend, a valve is placed, suitably weighted, to prevent undue pressure in the chamber.

I have now described the apparatus I use, but other and more simple appliances would be sufficient. The reason I use this more complicated apparatus is because I have other matters in hand connected with superheated steam. My present superheater is large enough to supply a chamber ten times the size of the existing one. A very good and simple form of superheater is made by bending a 7-8ths inch pipe backwards and forwards, four times to the length of 2 ft. or 2 ft. 6 in., and then embedding the coil so formed in cast-iron. Several of these can be joined together; they can be easily arranged in any existing furnace, and can be supplied with steam from an ordinary engine boiler. In this way an apparatus can be put up at a small cost.

Many persons have supposed, aye, and those well acquainted with engineering matters, that there is danger of explosions. Now this is not the case. The only care necessary is to attend to the boiler. After the steam escapes into the superheater and the chamber, the pressure is lessened to a mere nothing. Before leaving this part of my subject I may mention that experience has taught me that it is desirable to protect the iron pipes of the superheater from the direct action of the flames. This is easily done by placing fire bricks along their sides and allowing the flames to play over the top. I have lately spoken to Dr. Siemens on the subject of the size of the chamber that can be heated, and his opinion is that it is quite possible to sufficiently heat a chamber of any size that may be required.

And now a few words as to the material to be treated. Cast-iron requires a higher temperature and longer exposure, as a rule, than wrought-iron; but here a certain amount of experience has to be acquired by practice and this is very easily done by a careful workman. Thin articles want but a short exposure, for by too long action they can be oxydized almost throughout their mass. In heavy articles it is found that after a time the action becomes much slower and at last almost ceases; this is discovered by hydrogen ceasing to be evolved. The coating formed seals up the iron and prevents its coming in contact with the steam. Some sorts of cast-iron are more easily and more uniformly acted upon than others; the inferior kinds from the presence, I imagine, of carbon in the free state do not present a homogeneous surface to the steam and this causes a certain irregularity in the perfection of the coating. I do not think that this is of consequence in large articles, for even if red rust be formed in places its extent will be but trifling, and the rust will not spread, as I have abundantly proved by many experiments. Steel requires considerable care in its treatment: it should not be made too hot

before the superheated steam is turned on—otherwise it is apt to scale. An initial temperature of between 500 deg. and 600 deg. Fah. is quite sufficient, and the steam should be allowed to enter the chamber in not too great volume, but very steadily and completely. It has all along struck me that the operation could be carried on with superheated steam alone, without any auxiliary heat. The advantage of this will be manifest to the chemist for the decomposition of steam by iron begins at a definite temperature, and therefore, if steam alone be used, the iron cannot get too hot before it begins to reduce or take oxygen from the steam.

With a view to effect this, before our present chamber was completed, I tried an experiment with very favourable results. A pipe about 5 ft. long, and of 7 in. diameter, was closed at both ends with caps which could be taken on and off. The pipe was placed in a trough of sheet iron and surrounded with perfectly dry powdered chalk to the distance of about 6 in. This was to act as a non-conductor of heat. Superheated steam was then admitted through one of the caps and was allowed to escape through a long discharge pipe which pierced the cap at the other end. Superheated steam was passed in, and in about half-an-hour the pipe became of a dull red colour. The end cap opposite where the steam entered was then removed; iron articles were placed in the pipe, and sufficient time was allowed for them to get hot enough not to condense the steam. The steam was then turned on for four hours, and the articles became coated with the black oxide. The result was on the whole very satisfactory, and showed that the process could be carried out with superheated steam alone; but the apparatus was very rough, and simply intended for experiment. I have now one of a more permanent character with which I hope soon to make further trials, for I feel convinced that the process can be carried on with superheated steam alone. This will effect a great saving of time and money, and will admit of a much more extensive application of the process.

It can hardly be expected that a person as ignorant of engineering matters as I am can be able to devise the best and most economical mechanical arrangements for carrying out on a large scale the oxidation of girders, &c. I believe that I have shewn that large articles can be completely prevented from rusting, and that is all I ought to be asked to do. A very considerable sum of money has been spent in carrying out these experiments, and I think, now, that those who desire to apply the process commercially ought to adapt it to the particular manufactures in which they are engaged. Gentlemen of experience have told me that I am right in stating that chambers of any size can be heated and sufficient steam generated to keep them filled during the oxidising process, and if this be so articles of any size can be treated.

Another point of interest is whether the oxidising action interferes with the strength of the iron, and here, gentlemen, you will feel that this is a matter which deeply interests you. Whenever iron is used in construction it is for its strength that it is employed, because it combines this property with lightness. I have treated bars of iron which were supplied me by an eminent firm and these have been tested by them for tensile and breaking strain; they have reported to me that the result was so far satisfactory that they should not object to use the process from any fear of its weakening the iron. That the part which is oxidised ceases to give its original strength is true, but then this part is so small in quantity that in large structures it is inappreciable. They state definitively that the iron not oxidised is in no way changed. I cannot mention the name of this firm because, as they are not professional testers, they do not wish to be in any way mixed up with discussions which might arise. What they did was for my satisfaction, and as I am satisfied, I think it is for those who require further proof, and who desire to have the process tested, to employ Mr. Kirkaldy or any other professional testers. I shall be most willing to treat any pieces of metal to be submitted to his or their judgment.

Suppose, however, a small portion of the iron to be somewhat changed as to strength by the

oxidation, still the quantity is but small, as was proved by a piece of steel submitted to me by Sir Joseph Whitworth—it was $\frac{3}{4}$ in. in diameter, and he measured the increase after oxidation and found it to be the 1,000th part of an inch. This would bear no comparison with the loss of substance resulting from red oxidation or rust, and then the loss of strength by my process is known at once, and does not go on increasing as does that which results from the formation of common rust. I need hardly speak of the applications in which this process can be used for the benefit of your art; you, gentlemen, are more competent than I am to judge of how it may be made available both as regards strength and ornamentation. I will therefore at once proceed to the specimens before you and explain points, with respect to them, which I think are deserving of your consideration.

To me one of the most interesting of the articles before you is an iron bolt, one of the first specimens treated by my process about two years ago. After treatment it was exposed out of doors for some time —afterwards I had part of the black oxide filed off. It was then again exposed for many months, and you see that where the iron is exposed it has rusted, but where the black coat remains it has resisted the action, and the line of demarcation between the two parts is sharp and well defined, showing that the red rust has not thrown off the black oxide. This long pipe illustrates the same property as also does this cast-iron bracket: one side you will notice is not rusted at all, but on the other there are many rust spots. I had the black coating removed from where these spots occur, and the whole has been lying on the earth out of doors for more than two months, and I think you will notice that in no case has the rust extended further than the coating of black oxide has permitted it. There is also a pipe closed with a bung at one end in which water has been kept for more than two months, and into this bottle the water has been poured off, and you will not see a trace of rust in it. This pipe chair I kept many months in moist salt out of doors, and these articles have been kept in urinals, proving that urine has no action on the black oxide, neither do the deposits from it adhere to its surface. I have here appended a list of the articles which I have the honour to show you, and amongst them you will notice a handle which has been in sea water for ten days.

No.		
2	Rain-water pipes, heads and shoes	Falkirk Iron Company.
2	„ „ bends	
3	„ „ straps	
2	„ gutters and 4 brackets	
2	„ „ junctions	
6	Gas and water pipes (John Spencer, West Bromwich).	
5	Vent bricks	Falkirk Iron Company.
2	„ slides, round and square	
4	„ gratings	
2	Cantilevers	
2	Drain traps	
3	Brackets	
2	Door handles and latches	
1	Vase	
2	Pieces of Railing (Macfarlane, Glasgow), and 3 other ditto	
6	Grip handles (J. Kenrick and Son, West Bromwich).	
1	Saucepan „ „ in use two or three months.	
2	Bell pulls (J. Kenrick and Son, West Bromwich).	
2	Flower finials—hammered.	
1	Pedestal and statue, "Samson" (Macfarlane, Glasgow).	
1	Fountain statue (Falkirk Iron Company).	

No.	
1	Man in armour, 2 horses, 2 pen trays, 1 taper stand (all Berlin castings).
2	Urinals.
1	Dome ornament (Macfarlane).
1	Riveted plate.
1	Door porter.
1	Knocker.
12	Wood screws, 1 large boiler screw, 12 screw eyes.
1	Large rain water pipe (Macfarlane), out of doors for two months.
1	Grip handle, in sea water for ten days.
2	„ in urinal for fourteen days, unwashed.
2	„ „ „ washed.
1	Pipe chair, in moisture and salt for many months.
1	„ coating removed to show that rust cannot extend under coating.
1	Pipe chair, in urinal for many months.
1	Pipe, full of water for over two months, and the water therein contained.
1	Old bolt, partly stripped to show non-extension of rust to protected part.
1	Large bracket, the coating removed by hammering, &c., on one side; exposed on damp earth for two months.

Before concluding, I wish to mention that I coated some iron brackets about eight or ten months ago for Mr. Penrose. He tested them in his own way and was satisfied. They were afterwards put up outside St. Paul's Cathedral, and I hear they are perfectly free from rust; the screws, however, with which they are fixed, and which were not treated by my process, have rusted. Some have complained that unnecessary delay has occurred in bringing this process to a commercial and useful application. The delay has not been unnecessary, for I have, in the last two years, been able so to simplify the working of it as to render it very inexpensive. And now, Gentlemen, allow me to thank you for the kind and patient hearing you have given me.

Mr. J. T. Wood, F.S.A., Hon. Fellow, said the invention would be of the greatest advantage to architecture. Amongst small matters, for example, he might instance the screws which the carpenter invariably put into his mouth and wetted with saliva, so as to make them more easily driven home. They afterwards rusted in the wood. Screws treated by Mr. Barff's process, however, would take no harm under such circumstances. Everything in iron that the architect could design or specify, in fact, whether constructive or ornamental, could be advantageously treated by the process. Knockers, latches, and small articles of that kind, instead of requiring to be painted, would have beautiful blue-black lustre imparted to the iron by the process. Every one present must hope that the process would be as commercially successful as it appeared to be technically satisfactory.

Mr. J. Rawson Carroll, Fellow, said that, as showing the necessity for some such process as Professor Barff's, he might mention that he had heard that the Britannia Tubular Bridge,* over the Menai Straits, was suffering much from the want of a rust preventative. There was, doubtless, a process of rusting going on which must eventually, unless checked, lead to serious consequences. He had heard that tons of rust were extracted from the tube periodically. It would be interesting to hear whether Professor Barff's process could be applied to such structures *in situ*. For small

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* The following letter appeared in the *Builder* of the 22nd June, 1878 :—

Sir,—The Directors of the London and North Western Railway Company have called my attention to a statement recently circulated in some of the daily papers respecting the condition of the Britannia Tubular Bridge, carrying the railway over the Menai Straits, and more particularly to the discussion at the General Conference of Architects, as published in the *Builder* of the 15th inst. At this Conference Mr. Carroll is reported to have stated with regard to this bridge, that "there was no doubt a process of rusting going on, which must eventually, unless checked, have the effect of making the bridge come down with a crash," and that he "believed tons upon tons of rust were extracted from the Tube every month."

At the same Meeting Mr. Skidmore is also stated to have said that he "could testify to the enormous quantity of rust which it yielded."

I can, from an intimate personal knowledge of the structure, most unhesitatingly assert that these statements are utterly without foundation, and, as they are calculated to alarm railway passengers, I, in their interest as well as that of the railway company, publicly challenge the accuracy of the statements which Mr. Carroll and Mr. Skidmore have thought proper to make.

I may add that within the past few years I have, in conjunction with Mr. Ramsbottom, late mechanical engineer to the railway company, most carefully examined this bridge, as well as that over the River Conway, when the ironwork was found practically free from rust, the cells or chambers comprising the top and bottom members of the tubes perfectly clean, and the edges of the plates as sharp as when first placed in position.

These bridges are subjected to a periodical and critical examination by the resident engineer of the district, and I feel confident that, with the care and attention they receive in common with all other structures on this railway, there is no practical limit to their endurance.

William Baker,
Engineer-in-Chief, London and North-Western Railway.

articles, or for the component parts of bridges and similar structures before being built up, it would, if found successful, be of undoubted value. He should like to know what was the cost as compared with that of oil paint and other preservative coatings.

Mr. READE, Hon. Associate, understood Professor Barff to say that in treating bolts by his process there was an appreciable increase in their diameter, and this, as it seemed to him, would militate against the usefulness of the process as applied to the ironwork of roofs, &c., more especially for the bolts and pins used for the connections; for the thread of the bolt would be increased in diameter, and the thread of the nut decreased in the same proportion, which would prevent their being screwed up. For pins and bored holes an allowance for this might be made, if its amount was capable of being exactly determined. He would also like to know whether it was possible to treat by the process long pieces of roof framing, such as ⊤ iron rafters, say 30 feet long?

Mr. JOHN KERSHAW, C.E., Visitor, said that Professor Barff had mentioned 40 lb. as the pressure of steam at which he had conducted his experiments. Was it not possible to attain the end in view with less pressure of steam, and, if so, with how much less? He (the speaker) assumed that the steam was merely the medium of conveying the heat, the pressure being immaterial.

Mr. DAWSON, Fellow, gathered from the Professor's Paper that the protective coating of black oxide was imparted to iron articles by means of superheated steam, and that the thickness of the coating was about the thousandth part of an inch.

Professor BARFF said the thickness of the coating varied with the duration of the process. For most small articles that would be about the thickness.

Mr. DAWSON (continuing) said he should like to know which would be most benefited by the process—if there was any difference—thoroughly good cast iron, or thoroughly good wrought iron, because it was always found in practice that wrought iron rusted much sooner than cast iron. He took it that the whole of any built-up structure of iron could be treated by the process before erection, provided that a container could be made large enough to take in the largest single pieces of the structure,—which, he supposed, it would not be difficult to do. But then, how about the rivets? If they were treated by the process beforehand, would not the making them red-hot and hammering them destroy the preservative coating which had been applied to them? Probably in the case of bolts and nuts, the screwing-up by a spanner would not destroy the surface of black oxide. As to the advantages of the process if brought to perfection and generally adopted—especially if the cost were not very great—it would be waste of words to dilate upon them, for it would be one of the most magnificent inventions of the age. The Professor had mentioned the lamp-pendant which had been treated by his process, and fixed up in one of the western lobbies at St. Paul's Cathedral. From his (the speaker's) observations, however, it was only right to mention that in certain parts the pendant *did* show signs of rusting, such rust appearing in the form of small rings, all of which, as far as he could observe, were opposite where the welding had been effected. These rings were all of red rust, but there was no indication of spottiness or "pock-marks," showing, as he gathered, that the red rust did not get under the black oxide.

Mr. RALPH NEVILL, F.S.A., Fellow, asked whether hammering upon the surface of the metal had the effect of destroying the protective coating of black oxide. It was satisfactory to hear that the surface was not affected by ammonia.

Mr. SKIDMORE, Visitor, said that if Professor Barff's process were only applicable to iron articles of minor size, it would be of incalculable value, whatever might be its possibilities of

application to such structures as the Menai Bridge.* With regard to that bridge, he could testify to the enormous quantity of rust which it yielded, the man engaged in clearing it away being a veritable red man. As a worker in iron himself, he should gladly welcome any process which would preserve ironwork from its insidious but ruthless destroyer—red rust.

Mr. T. H. WATSON, Fellow, asked whether any special preparation of the metal was necessary before submitting it to Professor Barff's process? It occurred to him (the speaker) that the finish was partially, if not wholly, due to the process itself. The attainment of such a finish in ironwork elevated the metal almost to the level of bronze and the costlier metals. Many of the objects exhibited were equal in surface texture to copper or bronze. At the same time, the material could not be mistaken for any other than iron. Would it "age" in anything like the same way as bronze or copper?

Mr. ARTHUR CATES, Fellow, said that, even omitting all consideration of such large structures as bridges, the importance of preserving which from decay was exceedingly great, the application of such a process as Professor Barff's to architectural ironwork—much of which would otherwise, if left exposed, speedily decay—was of incalculable value. It was pitiable to see the way in which beautiful ironwork was perishing through the formation, by the action of the atmosphere, of the red oxide. Coating with paint, even if it were always effectual, when repeated over and over again completely destroyed the charms of the smith's handiwork, and obliterated those inflexions and markings by which a skilful smith added so much by his execution, to even beautiful designs. Professor Barff's process, however, had the great merit of not only not injuring the surface, but of heightening its beauty. When it was remembered that a great deal of beautiful ironwork had utterly disappeared owing to the action of rust, it would be agreed that it was impossible to overrate the importance of Professor Barff's process, provided that it fulfilled the expectations which had been formed of it. Professor Barff had not referred to the domestic applications of the process, as exemplified in the saucepan exhibited, and which, though it had been in constant use for some months, showed no perceptible signs of wear, nor was it furred or coated in the interior, as tinned or enamelled saucepans were apt to become. The only objection against the saucepan, and that was a fanciful one, was the blackness of its interior, but its cleanliness, durability and perfection of surface were undeniable. Another very important application of the process would be the protection of iron pipes used for the conveyance of water. There had been many attempts to produce conduits which would not be affected by the chemical agents suspended in the water. There had been tin-lined lead pipes; glass or glass-lined pipes had been proposed and tried;

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* The following letter appeared in the *Builder* of the 29th June, 1878:—

SIR,—A letter appeared in your paper from Mr. Baker challenging some observations of mine, made during a discussion which ensued on the Paper read by Professor Barff before the Architectural Congress, on a Process for preserving Iron from rust.

The assertion by a previous speaker, Mr. Carroll, that tons upon tons of rust were taken monthly from the tubes of the Britannia Bridge, I thought then, as I think now, was founded on some misapprehension; it is, therefore, an error to suppose I affirmed an assertion with which my judgment did not agree. So far from this view of the instability of the bridge, I should not hesitate to travel weekly through it for the residue of my life. That which I affirmed was that all iron structures in their natural state are liable to rust and decay, and that some years since I had seen a boy come out of one of the tubes of the Britannia Bridge covered with rust; and that if the process for prevention of rust, such as the one under discussion, could be applied to large structures, the gain would be incalculable.

Incidentally, the prominence given to this question may result in some good, a communication having been made to me which leaves little doubt that large iron structures, already erected, may be made impervious to rust. This I purpose testing strictly, and shall be glad if my anticipations are realized.

F. A. SKIDMORE.

enamelled iron, galvanised iron, and all kinds of materials had been used, some of them with partial success; but Professor Barff's process seemed to be the nearest approach to perfection that had yet been attained in that direction. As several of the pipes could be stacked in the vessel or container for subjection to the process, iron pipes so protected should not be appreciably dearer than those not so protected, while they would be much cheaper than, and immeasurably superior to, lead. In this way the many disadvantages and inconveniences attending the at present almost indespensable use of lead pipes would be avoided. With reference to the hardness of the coat of black oxide deposited on the iron by the process, he (the speaker) had before the Meeting made some inquiries of Professor Barff on the subject, from whom he learnt that the coating resisted the action of a file upon the surface, the only perceptible effect of filing being that the file itself became burnished, no effect being observable upon the specimen filed. That was a very important point. The resistance of the coating of oxide to a shock or impact was a point which Professor Barff had not touched upon. It would also be desirable to know something of the manner in which iron thus prepared resisted the action of considerable heat, and also of sudden changes of temperature.

The CHAIRMAN said it seemed to be the general opinion that, if Professor Barff's invention were successful—as they all hoped it would be, and as the Professor himself, as a chemist, believed it would be—it would be one of the finest inventions, so far as architects and engineers were concerned, that had ever been brought forward. When it was recollected that enormous treasures of art in iron had been lost through the action of ferric oxide, or red rust, the importance of the process, even from an antiquarian point of view, would be seen. There were in the British Museum a few—a very few—specimens of Assyrian ironwork, which had been preserved almost by a miracle. These would give some idea of the enormous amount of artistic wealth that must have been lost through the action of red rust. Reference had been made to the slow but sure destruction going on by the rusting of the ironwork of the Menai Bridge; the same destructive process was to be seen at many of our railway stations and bridges. He had seen whole courses of stonework in buildings by Sir Christopher Wren and his pupils, almost entirely destroyed by the rusting and expansion of the iron cramps with which the work had been tied together. If iron could be so treated by the Professor's process as to permit of its being safely used for cramps, it would in itself be of very great advantage, for at present it was necessary to use bronze, copper, or slate,—the latter being by no means a satisfactory material for cramps, and the others being too costly. Galvanized iron, though introduced to the world some years ago with a great flourish of trumpets, and at that time considered to be perfectly imperishable, had not been a success, for the rust was found to go on behind the coating of zinc. The question arose whether Professor Barff's process would come to grief in any similar manner? He (the Chairman) from what he had heard of it, and from what was stated by Admiral Selwyn when Professor Barff read his Paper before the Society of Arts, did not think this would be the case.

Professor BARFF replied to some of the questions raised during the Discussion. In answer to Mr. Carroll he said his process could not be applied to structures *in situ*, because every article to be treated must be raised to a temperature above red heat. He could not give any exact idea as to cost, but he might state that a chamber 5 ft. long by 2 ft. 6 in. by 1 ft. 8 in., which would hold a great many moderate-sized articles, would cost about 5s. for fuel during ten hours' working. That was his own experience, although it could, probably, be done for less, for he did not pretend to be studying the economical aspect of the process. His sole object at present was to do the thing well, leaving the question of economy to take care of itself. The process could, of course, be most profitably worked continuously, night and day, with relays of men. This method of work was

being pursued by Messrs. Spencer, of West Bromwich, who were working his process under a royalty. The cost under such circumstances would certainly be nothing at all approaching to that of galvanising. In answer to Mr. Reade's question, it was necessary to make bolts or nuts which were to be treated by his process of such dimensions as to thread and nut that, although before being subjected to the process, they would not fit, yet after treatment they would fit. This could be done with the greatest nicety. As to treating pieces of roof 60 ft. long, they would require an enormous chamber. Then, as to the questions of hammering and riveting: when rivets which had been treated by the process were heated or hammered, or pressed in by the riveting machine, the coating of black oxide was undoubtedly removed. This was, he confessed, a difficulty, but one which he thought he should succeed in surmounting. He was now trying experiments with an apparatus for reoxidising the heads of the rivets *in situ*,—although, for that matter, even though he were unsuccessful, he did not think it would be of very great moment for only the head of the rivet would be exposed, and it would not be possible for a rivet to rust right through. In answer to Mr. Kershaw's question, the extreme pressure of steam used in working was 40 lb., but sometimes it would not exceed 25 lb. But one point of the greatest importance was that there should always be such a sufficiency of pressure as to exclude the oxygen of the atmosphere. In answer to another speaker, the thickness of the coating of black oxide would vary according to the duration of the exposure of the article to the superheated steam, and according to the bulk of the article treated. In oxidising a thick mass of iron, the pores would become thoroughly closed, and as no more steam could enter the material, the operation was at an end. If, on the other hand, thin sheets of iron were treated by the process, they could be oxidised almost right through, leaving only a thin film of metal in the centre. This rendered the metal very brittle and easily broken, hence the necessity of care in the treatment of thin pieces of metal. Both wrought and cast iron were equally benefited by the process. As to the appearance of the surface of iron treated by his process, it was solely the result of the process, nothing being done to prepare it. He had not seen the pendant at St. Paul's, but Mr. Penrose had told him that it had not rusted. The indications of rust referred to by Mr. Dawson might have been caused by the workman who fixed the pendant abrading the surface of the coating with his pincers or gas-tongs. At any rate, it was satisfactory to hear that the rust, whatever its cause, was localised. As to the question whether the surface of the protective coating was strong enough to bear hammering, he thought it was; at any rate, it could not be removed unless wilfully. The coating did have a tendency to chip when continuously hammered, but a nail treated by the process could be driven by the hammer without injury. In answer to Mr. Watson, no preparation of the surface was required beyond the removal of red rust (if any existed) by pickling the article in dilute sulphuric acid. Time would not "age" iron treated by his process—at any rate, not in the sense in which copper and bronze were affected by long exposure, and the expansion or contraction of the metal did not affect the preservative coating in any way. In conclusion, Professor Barff observed that the Conference was on the following evening to discuss the subject of fireproof constructions; he might perhaps be allowed to say that it would be a very great thing if the ironwork in them were oxidised by his process, as it would then be a very long time before the iron could be burnt away. He believed that in most systems of fireproof construction wet concrete and cement were placed in immediate contact with iron girders, and hence rust must be set up. He could only say that the observation of two years had thoroughly convinced him of the permanence of the results attained by his process.

Royal Institute of British Architects.

GENERAL CONFERENCE, THURSDAY, JUNE 6TH, 1878.

Afternoon Meeting: JOHN WHICHCORD, F.S.A., Vice-President, in the Chair.

THE MODEL BYE-LAWS AS A BASIS OF A GENERAL BUILDING ACT.

By J. DOUGLASS MATHEWS, Fellow.

AT the last General Conference of Architects held in 1876, the subject of General Building Regulations was introduced in a Paper by Mr. Honeyman, of Glasgow, in which he called attention to the unsatisfactory state of the present system of building requirements, and the desirability of a Building Act to apply generally throughout the United Kingdom. Mr. Clarke, of Liverpool, followed with a Paper bearing on the same subject, pointing out some of the defects in the Liverpool Building Act, and suggesting that the general Act should embrace sanitary as well as building requirements. The desirability of promoting a uniform system of building, as far as possible, throughout the Kingdom, having been admitted, I will not take up time by further introduction, except to say, that the Local Government Board had under its consideration, at the time the Conference was taking place, a Code of Bye-laws, which was proposed to be issued for adoption by local sanitary authorities constituted under the Public Health Act (1875); and the Code dealt with the subject in much detail.

It is only right that I should mention that the Conference Meeting concluded with the following resolution:—

> "That the Council of the Royal Institute of British Architects be requested to appoint a Committee to consider the subject of General Building Regulations for the United Kingdom which shall communicate with the Provincial Architectural Societies and the Local Government Board and report at the earliest period to the Council."*

The Council acted on this suggestion and put themselves in communication with the Local Government Board, who at once accepted the services offered, and sent proof copies of the proposed Bye-laws with a request that they should receive the consideration of the Council. The several architectural societies having been communicated with, a Committee was formed, under the presidency of our Chairman, and at a great number of Meetings considered very fully the proposed Bye-laws in detail, making such alterations and amendments that they considered necessary. These were reported to the Local Government Board, and, shortly after, the Bye-laws were issued in their present form, many of the suggestions being embodied therein.

At the outset let me explain that these Bye-laws are prepared and issued in accordance with section 157 of the Public Health Act (1875), which gives to urban authorities power to make bye-laws as to the construction of new streets and the sewage thereof, the structure of walls, foundations, &c.,

* This Report is printed at page 294.

and chimneys, the sufficiency of space around buildings for securing ventilation, the drainage and the closing of buildings unfit for human habitation. To ensure uniformity of requirements and proper supervision, the Bye-laws have been issued as a model by the Local Government Board; it is desired that in course of time the various bye-laws in force in different parts of the country may be exchanged for the new and approved ones. Perhaps before this is accomplished the need of a Building Act to apply generally will be considered so necessary that these Bye-laws will give place to an Act of Parliament to regulate all buildings throughout the country.

I feel myself at some disadvantage in bringing the subject under your notice, having very recently read a Paper on the proposed Bye-laws before the Architectural Association, but I propose now to treat them as specially applicable to the purposes of a General Building Act.

It appears desirable that a Building Act should deal with all matters appertaining to building, so that from the laying out of a road to the plastering of the walls of the houses built therein, the provisions should be clearly understood by all the parties concerned, and the administration should be in the hands of one authority; and although in the larger towns the supervision could be placed in the hands of two or more officers, in smaller towns it could be undertaken by a single officer, as it is of consequence that the official expenses in carrying out an Act of this kind should be as moderate as possible.

The purposes of a Building Act being for the maintenance of public health and safety, it should contain provisions for—

1. Laying out and constructing new streets and sewers.
2. The construction of buildings, including foundations, walls, chimneys, and other things to ensure stability of construction and protection from fire.
3. Suitable means for rendering buildings healthful and ensuring proper ventilation and fresh air.
4. The arrangement of drains and closets and water supply thereto.
5. The construction of public buildings.
6. The rights and obligations of neighbours in reference to party walls.
7. The removal or amendment of dangerous structures.
8. The administration and enforcement of the law.

I propose in the briefest manner possible to bring before you the chief provisions of the Bye-laws, and to offer a few suggestions as to their adaptability for a general Building Act. I may remark generally that the Bye-laws appear to be conceived in a somewhat arbitrary spirit, for although it is of the greatest importance that in London and large towns where speculative building is carried on to a considerable extent, every means should be taken to enforce good building; yet, if the Act is to be general this class of building in many places is the exception rather than the rule, and therefore care must be taken not to impose needless requirements or to fetter the conscientious builder more than is necessary, otherwise the difficulties will be so great in enforcing it, that in time it will practically become a dead letter as is the case with many of the present local Acts.

One great defect in the Bye-laws is that they do not apply to alterations to old buildings, which of necessity must be remedied in a general Act.

In the case of new streets it is provided that they shall be formed at easy gradients and suited to the adjoining streets; that all carriage roads shall be 36 feet wide at least, except where the street is less than 100 feet long, in which case it may be 24 feet at the least; and that every street shall be opened at one end at least the full width. It is provided that alleys or passages at the back or sides of buildings to prevent ashes, soil and refuse being carried through the house, may be formed of any width. Details are given as to the curve and width of the roadways, and the inclination

and width of footways and heights of kerb; and also that no building shall be less than 24 feet distant from the boundary of any lands or premises opposite thereto.

The law which allows streets 100 feet in length to be 24 feet wide, although of much value when it is only intended as an approach to two or three houses, has been found to work badly in the Metropolis, as streets have afterwards been formed of the full width required, the approaches being only 24 feet wide. The provision requiring one end only of a street to be open seems hardly consistent with other laws for ensuring ventilation and the circulation of air.

The Public Health Act, in addition to the foregoing, includes provisions for the regulation of streets, as to their construction, paving and sewering; powers to purchase premises for the improvement of streets, and to regulate the line of buildings and projections therefrom; the Towns Improvement Clauses Act also contains provisions for naming streets and numbering houses, improving the lines of streets and removing obstructions, all of which should be collated and embodied in a general Building Act.

For the construction of buildings, including foundations, walls, chimneys and other things, to ensure stability of construction and protection from fire, the Bye-laws require that the footings of every wall shall either rest on the solid ground or upon a sufficient thickness of good concrete, or upon some solid and sufficient sub-structure as a foundation. All walls are to be constructed of good bricks, stone or other hard and incombustible materials, with good mortar composed of good lime and clean sharp sand, or other suitable material, or good cement; and the walls are to be of thicknesses proportionate to their length and height. These thicknesses are in most cases greater than the requirements of the Metropolitan Building Act, which for many years past have been found sufficient in practice.

Walls may be divided in their lengths by means of return or cross walls, which must be carried to the top of the topmost storey and be of the thickness equal to two-thirds that of the external and party walls, and solid for at least two-thirds the area. This also is in excess of the Building Act, which allows the cross walls to be two-thirds the height of the main walls, and open for one-half the area, which as a rule is quite sufficient to form a good tie to the outside walls.

The sets off to the walls are taken to the top of each floor instead of to the underside, and the heights of the storeys are measured in a similar manner; the reason is not apparent, and the result is that floors enclosed with walls less than 14 inches thick cannot be more than about 9 ft. 4 in. in height, although 10 feet is allowed in another clause. Provision is made to obtain higher stories than sixteen times the thickness of the walls in houses and fourteen in warehouses by means of piers equal to one-fourth part the length of the walls, or as buttresses, if an equal area is obtained by greater projection. Permission is also given for openings more than half the area of the wall in each storey by providing *sufficient* piers of brickwork or incombustible materials. If the walls are built of stone or of clunches of brick, or other burnt or vitrified material, the beds or courses not being horizontal, the thicknesses are to be one-third greater than bricks.

No special provision is made for the use of concrete as a building material except that, if a wall is built of other suitable material it may be of the thickness prescribed for brickwork, but this leaves a wide door open for the use of concrete or other material of an inferior description, and unless the suitability of the material can be readily determined would be productive of considerable difficulty. It is required that, in addition to the bearing on the walls, bressummers shall be further supported, where necessary, on storey posts, iron columns, or other supports.

As a precaution against fire the Bye-laws provide that all woodwork shall be set four inches back from the face of the wall except for loophole doors; that the external walls of all buildings within

a distance of 15 feet from any other building shall be carried up to form a parapet; that party walls of warehouses and public buildings shall be carried above the roofs three feet, and in other buildings 15 inches; that no plates or timbers be built in party walls, and no timbers bear thereon nearer than 4½ inches to the centre line; that the open space inside all partition walls (*i. e.* between the quarters), and also between the joists in any wall, shall be stopped with brickwork, concrete, pugging, or other incombustible material.

The requirements for flues comprise provisions for building and properly bonding and corbeling under certain circumstances; formation and parging of flues, and carrying the same up to a height of three feet above roof. The thickness of the brickwork is to be nine inches for furnaces, cockles, steam boilers, close fires, cooking ranges and apparatus, to a height of 10 feet above the floor. The backs of fireplaces of kitchens are to be nine inches thick to a height of six feet above the chimney openings. All arches over chimney openings and arched chimneys are to have wrought iron bars with some exceptions. All woodwork is to be kept a safe and definite distance from chimney openings, flues, and smoke pipes; and all roofs, dormers, turrets, and other erections on roofs must be covered externally with incombustible materials. No provision is made in the Bye-laws for the construction of flues, for these, with other requirements, are comprised in the Chimney Sweepers' Act, which is incorporated with the Public Health Act. It is somewhat strange that no mention is made of hearths and trimmers; in fact it would be well if the provisions of the Metropolitan Building Act were generally adopted as experience has proved them satisfactory.

In some of the Local Acts, as well as in the Bye-laws of some towns, tables of scantlings for joists, beams, roofs and other timbers are given; and as so much of the stability of a building depends on the construction of floors and roofs, it would appear desirable that some carefully considered tables or schedules should be included. As the use of iron in buildings is now so general some tables or formulæ for determining the size and section of iron joists, girders, columns, storey posts, &c., might well e added. The difficulty in preparing and enforcing such tables would, however, be very great, because so many special cases would arise that they would not always apply; and as the qualities of the materials used would differ, such tables might either be attended by danger, or else, to guard against such a result, the requirements might become arbitrary.

The provisions in the Bye-laws to promote health and sufficient light and ventilation, are as follow:—That no building shall be erected on ground impregnated with animal or vegetable or fœcal matter, until such matter has been removed; that a layer of cement concrete six inches thick, or a coating of asphalte, be spread over the whole ground surface of a building; that a damp-course of lead, asphalte, slates in cement or other durable material, be laid in all walls, not less than six inches above the surface of the ground adjoining; that all walls shall be properly coped, or otherwise protected to prevent water from running down the wall or soaking therein; that in the lowest storey of a building provided with a boarded floor there shall be a clear space of at least 3 inches under the joists for ventilation, and air-bricks provided for this purpose.

Most of these provisions are new in the Metropolis, and although very desirable, would in their present form, I fear, be found unworkable. For instance, in many cases it would be impossible for building purposes to remove all ground impregnated with animal or vegetable matter, as it would be difficult to say that any material used for filling in was entirely free from such ingredients; and there appears little reason for its removal if means are taken, by concrete or asphalte, to prevent foul gases from entering a house. No mention is made of dry areas or other means of keeping the earth from the basement walls, and as the damp course is to be laid 6 inches above the ground line, the basements would be damp and unhealthy, and unfit places for dwelling or working. The

want of this provision would be more than ever felt if, although the rubbish was excavated for the house, similar material was allowed to abut on the enclosing walls. The law which requires the external walls, if within 15 feet of another building, to be carried up as a parapet, although it may tend to prevent the spread of fire, will be a fruitful source of damp and disease, as the coping will oftentimes be no more than bricks; and the inferior material of which some of the gutters will be formed will become leaky, and far more likely to render the house unhealthy, than if the slates were to run over the walls to form eaves.

For the purposes of ventilation and free circulation of air, the Bye-laws provide that in the rear of all buildings there shall be a clear open space above the level of the ground of at least 150 square feet, which shall run the whole width of the building, and be in no case less than 10 feet wide between every part of such building and the boundary of lands and premises adjoining. If the height of the building be 15 feet, then a space 15 feet wide shall be given; and so on up to 25 feet wide if the building is 35 feet or more in height. No alteration in any building is at any time to be made which will interfere with the foregoing dimensions.

These requirements may be desirable to obtain a sufficiency of pure air, and may be practicable in small towns where land is not very valuable; but I venture to think that, if these laws were embodied in a General Building Act in such places as Manchester, Liverpool, or other large towns, it could not in the great majority of cases be carried out, as it would require, for an ordinary shop and dwelling-house with rooms built out in the rear, a plot of land at least 32 ft. 6 in. frontage and 75 feet deep. This restriction would also prevent the use of the entire ground floor for trade purposes.

Other provisions for light and ventilation are, that all rooms shall be lighted direct from the external air by windows at least one-tenth the area of the room, with one half to open to give top ventilation. Either a fire-place is to be constructed in every habitable room, or an aperture or air-shaft of at least 100 square inches formed.

For the proper ventilation of closets, it is required that all closets shall be placed against external walls and provided with a window not less than 2 ft. by 1 ft.; adequate means of ventilation must be obtained either by an air-brick, air-shaft, or other approved method. Water-closets lighted by skylights and provided with top ventilation seem to be ignored.

The provisions for drainage and water-closets are prepared with great care, and as they are based upon a principle the very opposite to that formerly employed there will be difficulty in getting them readily adopted. Instead of hermetically sealing drains and cesspools, it is proposed to allow as much air as possible to pass through them; and soil pipes and cesspools are to be properly ventilated. All damp sub-soils and the lowest stories of all buildings are to be drained into a sewer. The pipes are to be of glazed stoneware, and where laid as soil drains, they are to be bedded in concrete. Main drains are to have a trap as near the entrance to the sewer as practicable. No drains inside a house are to have any inlet other than from a water-closet or slop-sink, and all overflow pipes must discharge externally over an open trapped grating.

All closets are to be provided with a separate cistern or with means of supplying the closet with water other than directly from the cistern used for the supply of drinking water.

The position and construction of earth-closets, ashpits, privies and cesspools are provided for in a very detailed manner; but sanitary science can hardly be said to be so thoroughly understood that laws now made will of necessity be of the same value in twenty years time. It is undesirable to incorporate such provisions in a Building Act, which should be so drawn as to render constant amendments unnecessary. As an instance of this, I may mention that the use of pan-closets and

D-traps is distinctly prohibited; and I can hardly conceive that the public generally are so dissatisfied with them and their working, that they would readily for ever give up their use the day the new Act became law.

It appears to me that the Medical Profession have had a little too much their own way in framing these clauses, and therefore instead of embodying these or other clauses in the Act, powers to make bye-laws should be given to each Local Authority, subject to the approval of the Secretary of State, which would leave each town free to adopt what may be considered the best sanitary improvements.

The construction and inspection of drains can hardly be said to come within the scope of a General Building Act, and in large towns it would no doubt be placed under the care of an officer distinct from the building surveyor. At the same time the health and comfort of a house depend as much on the proper construction and working of the drains as on any other part of the building; it is therefore of the utmost importance that special supervision should be bestowed by a properly qualified official, and in small towns, where there is not sufficient work for more than one officer, he would no doubt be required to fulfil both duties.

But I venture to think, whatever be the requirements and however careful may be the supervision, unless there is a very great improvement in the present laying and connecting of drains, all these precautions will be comparatively useless; and I strongly advocate that the whole of the works connected with house drainage should be executed by a person who should make this his special work, and be responsible, under a heavy penalty, for the works being properly carried out. Such persons should receive a special license from the local authorities, or else the authorities themselves should execute these works and charge the cost to the owner. I should prefer the latter course, because the whole system of public and private drainage would then be in the hands of the local authorities. A plan of the drains of every building would be registered, and the works be executed under a schedule of prices, which would not bear unduly hard on the owner.

It may be thought this is interfering too much with private rights; but as we are told that the death-rate is increased more by defective drains in a house than by imperfections in the sewers, it is only right that all means should be taken to render the former perfect; and as Clause 41 of the Public Health Act empowers the local authority to enter premises to ascertain whether the drains, water-closets, earth-closets, privies or cesspools are in proper condition,—and as, in case of default, after giving the requisite notices, the work may be executed at the cost of the owner—I do not see, on the principle of prevention being better than cure, much hardship in the drains being constructed in a proper and satisfactory manner before the building is completed.

There does not appear to be any provision in the Public Health Act for the supervision of public buildings, and although a definition is given in the Bye-laws of a public building which is very comprehensive, yet, with the exception of the walls to be of the thickness required for the warehouse class, and that adequate ventilation shall be provided, there is nothing in the Bye-laws specially relating thereto. It is manifest that in all towns the construction and supervision of buildings used as churches, chapels, hospitals, workhouses, schools, theatres, concert, ball and lecture rooms, and other places where the public congregate, should receive most careful consideration; either a General Building Act should contain detailed laws applicable thereto, or else a competent authority should have power to supervise them, subject, in case of difference, to an appeal. I think the latter course would be the better, because the requirements would differ in almost all cases. Not only should the thickness of walls, strength, and framing and fixing of timber, iron, &c., fireproofing of passages, corridors and stairs, and possibly ventilation, be considered; many

minor details, such as the number and position of doors to allow of speedy egress, the opening of doors outwards, the protection of stairs, freedom in the aisles of churches and the passages of theatres from chairs and seats blocking up the way, and other things, should be taken separately and each case dealt with on its merits.

It has unfortunately happened in many cases where temporary buildings have been erected for public processions, races, &c., that loss of life has occurred in consequence of the careless and ignorant manner in which stages and platforms have been constructed; and to prevent further accident it is desirable that, in a Building Act, provision should be made for special supervision, so that before any structures are used for public purposes a license should be obtained and the responsibility of sound construction thereby rest on some official person.

In the face of so much litigation relative to party walls and structures, and the joint rights of building and adjoining owners out of the Metropolis, it is very desirable that a General Building Act should include provisions determining the rights of the respective owners. Although it often happens in towns that each house has its own wall or partition, where the area is limited and the ground proportionately valuable this practice must be abandoned in favour of party walls; and the advantages in point of expense and room will nevertheless outweigh the occasional difficulty and litigation attending such structures.

That portion of the Metropolitan Building Act which deals with party structures was drawn with much care, and considering the many and difficult cases in the Metropolis the provisions may be considered to meet the requirements, and therefore their adoption in the proposed Act is suggested. In this Act certain rights are given to the building owner to deal with the wall or structure in such a manner as to make it suitable for the purposes of his new building, subject to proper notice being given to the adjoining owner, who has the power to object if the works proposed are not absolutely necessary; in the case of disagreement the matter is to be referred to a third surveyor, who shall prepare an award which shall be binding on both parties, subject to an appeal to the County or a higher Court. It also deals with the manner in which the work is to be carried out, and with the proportion of the expense to be borne by each owner.

In smaller towns where land is not very valuable it may be better to build each house with its own walls, whereby independence is ensured, which cannot be the case if there is but one wall between two houses; and to prevent loss of ground the Bye-Laws meet the case by allowing the omission of footings if they adjoin another wall.

The removal or amendment of dangerous structures and ruinous buildings should certainly be dealt with in a General Building Act, and although provisions are contained for this purpose in the Towns Improvement Clauses Act of 1847, they should be embodied in the general Act. The provisions in the Metropolitan Building Act may be taken as a basis. These consist of clauses empowering a survey to be made of any buildings reported as dangerous, for the preparation and service of notices, the issue of summonses and summary order by a justice for the demolition or amendment of the structure and removal of the inmates; and also for the payment of fees and expenses, and power to execute the necessary works if the owner fails in so doing. Some provision should be introduced to empower the authority to approve or, if necessary, require proper shoring.

However good may be the provisions of a Building Act, unless proper means are taken to administer and enforce the law, it will soon become practically useless; it is for want of this that many of the local Acts are of so little value, and therefore care is required to prevent it being irksome on the one hand and lax on the other.

To ensure the Act being properly carried out, it is necessary that sufficient information should be

given to the authorities by the parties building to explain their intentions; that properly qualified officers should be appointed to supervise and direct the works in accordance with the Act, and provision made for their remuneration; and also that simple means should be adopted to properly enforce the law.

As regards the first of these, the Bye-Laws require much information that is of little or no value to the officials, and much useless expense and trouble would be incurred by the parties building. As I have already expressed my views on this subject, I venture to quote from my former Paper as follows :—

"In the case of the laying out of new streets, a notice accompanied by plans showing the names of the owners of the land through which such street is intended to pass, the level and width, intended mode of construction, name, size, and number of intended building lots, and sites, height, class, and nature of the proposed buildings, and height of the division and fence walls, is to be deposited. For what purpose the detailed particulars as to the proposed houses and division walls are required for the construction of the road is not apparent, and it would be difficult and dangerous in many cases for an owner to pledge himself until he sees the nature of the property such road is likely to accommodate.

"As to buildings, it is required that with the notice shall be deposited complete plans and sections of every floor drawn to a scale of not less than 1 inch to 8 feet, showing the position, form and dimensions of the several parts of such buildings, and of every water and earth closet, cesspool, well, &c. Also a block plan, showing the position of buildings and appurtenances of properties immediately adjoining, the width and level of street in front and rear, and all particulars as to drainage, and, in addition, a description in writing of the materials of which the building is intended to be constructed, and the water supply.

"These being matters which personally concern us as architects, I think that we should strongly protest against such requirements, many of them being quite useless to the sanitary authority, others being better known by the authority than the intending builder, and causing a needless expense.

"It is most desirable that a block plan showing the proposed system of drainage, the distance from road and adjoining properties, also the levels of the ground and basement floors, should be submitted and deposited; but it is too much to expect the position of buildings and appurtenances of the properties immediately adjoining to be shown, which could often only be obtained by special permission of adjoining owners, who are not always friendly disposed towards new comers. There is no apparent reason why a written description of the materials to be used in the execution of the work should be sent, as, with few exceptions, the bye-laws do not affect them, and the clause as it stands would enable the sanitary authority to demand a pretty full specification; and, lastly, I fail to see what advantage complete plans and sections, with dimensions of the several parts, are to the sanitary authority; nor why the owner is to be compelled to submit all details of his proposed buildings to the curiosity and criticism of his neighbours, which must be the case if deposited with a public officer; nor why the architect should send copies of his drawings, which might be made use of by any of the officers or members of the Local Board for their own purposes if they were so disposed.

"As it is evidently anticipated that all buildings will be inspected from time to time during their progress by the surveyor, there can be no more need for these particulars to be furnished than there is for the same information to be given to every district surveyor with the builder's notice, and, indeed, I think there would be more responsibility attaching to the surveyor to see the building carried out in accordance with the deposited plans than in visiting the building from time to time to ascertain whether the bye-laws were being properly obeyed."

In further proof of this I may mention that only a few weeks ago at a Select Committee of the House of Commons on the proposed amendment of the Metropolis Building and Local Management Acts, a somewhat similar requirement was proposed in the Bill, and it was stated by Sir James Lawrence, a member of the Committee, that if this was insisted on it would entail an expense in the Metropolis alone of from £5,000 to £10,000 yearly.

The administration of the Bye-Laws is entrusted to the Local Sanitary Authority, which is more or less subject to the Local Government Board, and can hardly be said to be an independent body. However advantageous this may be in the case of small towns and unions, I think that in large towns where an Act of Parliament would generally apply, the Corporation or other elected local body should be charged with the sole power to administer the Act; for although in some things centralization may be good and advisable, yet if the power of conducting its own business is withdrawn from each

town, local interest and pride will in a great measure be lost. I much doubt whether the results obtained in the administration of the Poor Law and other matters where central authority supersedes local, is sufficient to justify the curtailment of rights and privileges hitherto enjoyed by citizens; and therefore as the Metropolitan Board of Works is the sole authority to carry out the Building Act in London, so also should the local Corporations do the same in their respective boroughs.

An important duty devolving on the authority, whatever it may be, is the appointment of suitable persons to see the Act fully and properly carried out. At the risk of differing from many, I think this can be better and more efficiently performed by an independent person than by a salaried officer, especially if such officer be empowered to sanction plans for public buildings, dangerous structures, and other things requiring more than ordinary information, or if he be placed in a superior position to practising architects. In some places it would doubtless be found difficult to procure the services of an architect who could or would properly discharge the duties required, in which case it must rest with the authority to appoint an officer, but this should be the exception rather than the rule. In any case the surveyor should be thoroughly qualified and be duly examined and certificated; the payment of supervision should be made by fee rather than by salary, and thus the cost of supervision would be placed on the person building instead of on the rates as at present adopted in Local Boards.

It will be found in all towns, notwithstanding the utmost care in drawing up an Act of Parliament, that there will be many things where the Act would become too arbitrary if rigidly carried out, or would not meet the purposes intended, and therefore a power should be given to the Corporation or other authority to modify the Act in certain particulars which, if necessary, may be defined. If it is found that even more latitude is required or an appeal is demanded from the authority, a Board of Appeal might be formed in London composed of properly qualified persons whose decision should be final and binding on all parties.

For the enforcement of the general provisions of the Act, summary proceedings taken before a Justice have been found to work fairly well in the Metropolis; the provisions of the Metropolitan Building Act should be embodied in a general Act for this purpose, and in case of appeal I would suggest that the Board of Appeal just mentioned might be constituted as the proper authority.

In the foregoing remarks I have endeavoured, in putting before you suggestions for a General Building Act, to bring under your notice the principal provisions of the Model Bye-Laws upon which such an Act will probably be based; and as these Bye-Laws will doubtless soon be extensively adopted, it is of importance that all means should be used to render them as perfect as possible and adapted to carry out their objects. I therefore hasten to leave the matter in your hands for discussion, simply suggesting that, as the subject is too large to admit of anything like a final resolution being passed to-day, it may be brought under the notice of the several Architectural Societies and receive the attention of individual architects, so that a definite resolution or memorial may be adopted at the next Conference. In this way it appears to me the Conferences will be of real value to the profession and productive of satisfactory results.

Mr. T. CHATFEILD CLARKE, Fellow, said that Mr. Mathews's Paper appeared to be a most careful analysis of the Model Bye-laws. Mr. Boult's Paper* also contained several valuable suggestions; and with regard to Mr. Honeyman's Paper,† and especially its last point, it was desirable that the Conference should be reminded that in the Buildings Act Amendment Bill now before Parliament, there was a clause under which arrangements were to be made that in future, bye-laws adopted by local authorities shall be submitted for examination to the Institute of Architects and the Institution

* See Appendix, p. 292. † See Apendix, p. 291.

of Surveyors, by whom they would have to be considered before being sanctioned by the Government. That concession was made by the Metropolitan Board of Works. It was a very important point gained, and it had been, he believed, most graciously conceded. With regard to two or three of the general questions raised in the Papers, he thought that although architects ought to be, and were, as a rule, willing and desirous to afford public sanitary officers every facility for understanding their plans, it would be a fatal mistake for them ever to consent to furnish to the local authorities full copies of all plans, sections, elevations and detail drawings. Such a requirement was not only unfair to the architect, but it was unnecessary. The Institution of Surveyors in a report on the Metropolitan Buildings Act Amendment Bill, protested against a proposal of the kind which was contained in that bill as drafted, and the objections to it had had such weight that that point also had been very graciously conceded—in substance, at any rate. Such regulations would not only impose upon the professional man a great deal of unnecessary labour, without recompensing him for it, but it would also deprive him, to some extent, of the copyright of his drawings. As to another point touched upon in the papers, he very much doubted the wisdom or desirability of conferring very large dispensing powers, with regard to the requirements of an Act of Parliament, upon any body of men. He agreed that the higher in social position were the men, the higher would be the character of the local authority, and the greater safety would there be for the public interest; but to place too great a dispensing power in the hands of such bodies, and especially in the hands of the smaller ones, was not wise; in fact, it could only lead to increased difficulties and much mischief. The true policy, as it appeared to him, of building legislation, was that advocated by Mr. Boult, viz., the laying down of certain leading principles applicable to the whole kingdom, and upon the lines of which, and only in accordance with which, should buildings be permitted to be erected anywhere—taking due care, of course, to make those leading principles sufficiently elastic to allow of bye-laws being made in conformity with them to suit peculiar requirements of locality or material. The subject was one of great interest and importance, and although it was not possible for the Conference to discuss it in detail, they might usefully indicate what should be the scope and tenour of a Building Act applicable to the whole country—an Act which should be so framed as not to in any way fetter or discourage building speculation, provided always that due precautions were taken for the public health and safety in respect of sanitary arrangements and construction. In London, as was perfectly well known, it was exceedingly difficult to construct houses for the working classes which, while meeting all sanitary requirements, were remunerative to their builders. If all sanitary and structural requirements were attended to in buildings of that class the margin of profit was too small to offer great inducements to capitalists. Unnecessary and vexatious requirements in a Building Act for the whole country were therefore to be deprecated, as they would have the effect of increasing the cost of workmen's dwellings especially, and lead to overcrowding and other evils.

Mr. E. B. Ellice-Clark, Visitor, said that having for some fifteen years been a town surveyor, he could say that he had never found the least difficulty in obtaining from architects and builders complete plans and sections of all buildings erected in the towns where he had held appointments. And he would further say, that, so far as his experience and observation went, it would be a gross libel upon town surveyors and other local officers to say that they made any improper use of the plans entrusted to them by architects. The local officers were nowadays, except in a few of the smaller towns, professional men, many of them being architects; and, from personal knowledge of nearly every borough surveyor in England, he could say that he did not believe that any one of them would make surreptitious or improper use of plans coming under his cognizance. As a matter of fact, in the vast majority of instances, the plans were not of such great value or novelty as to be

worth notice, and he felt compelled to say that the plans submitted by professional architects were not, as a rule, nearly such "workable" plans as were those submitted by builders. He thought Mr. Douglass Mathews had taken the right course in his Paper, and, with one or two exceptions, he agreed with his conclusions. He (the speaker) had gone very carefully through the Model Bye-laws issued by the Local Government Board, and had come to the conclusion that they were, as a whole, impracticable, unworkable, and inquisitorial; he was greatly surprised to hear that any portion of them had passed through the ordeal of examination by the Royal Institute of British Architects and a kindred society, for they contained provisions which were absurd and impossible to carry out. Mr. Mathews had, no doubt, raised a very important point in laying it down as a principle that the regulations of building construction and material should be separated from purely sanitary details and the construction and laying out of roads and streets. Whatever the cost, it was to the public interest that bad and unhealthy building should be prevented. The full and complete supervision which was necessary would find honourable and not badly-paid employment for a number of architects. He did not think that the Model Bye-laws, as issued by the Local Government Board, would be adopted in any town. He had consulted the surveyors of a large number of towns, and, with three or four exceptions, strong disapproval had been expressed with reference to the requirements of the Bye-laws, which were in some respects so stringent that local bodies would not dare to carry them out. The fact was that the people wanted educating as to structural and sanitary requirements, and until they were better educated on those points it would be impossible to carry out such a code as that put forth by the Local Government Board. In the South of England the people were more prepared to adopt the Model Bye-laws than such places as Hanley, in Staffordshire, where 4½-inch party-walls were general. The provisions of the Bye-laws as to the widening of streets clearly showed that the Government was attempting to effect, or to cause to be effected, public improvements at the expense of individual property-owners. Indeed, cases were conceivable, and very possible, in which a man, after complying with the requirements of the Bye-laws as to setting back property pulled down for rebuilding, would only have a depth of 3 ft. for building upon. Absurdities of that kind abounded in the Model Bye-laws, and it was only reasonable to expect that the Local Government Board would have been more careful before giving its authority to such a mass of impracticabilities. Although, however, it was quite true that the Bye-laws went too far, in some respects further than the Metropolitan Building Act, in others they did not go far enough. One provision of the Bye-laws was that no wood whatever was to be put in any party-wall, no matter how thick the wall might be. That was simply ridiculous. In the case of bressummers carrying house-fronts over shops, instead of looking at them in the proper light and prescribing the depth of the beam according to the span and the weight of the superstructure, they simply said that, in addition to whatever bearing the bressummer might have upon the party-wall, it should have an additional bearing of 4½ in. on a corbel. He did not think it would be possible to bring old buildings undergoing repairs or enlargement in the same category as new ones in respect of supervision, or, if it were possible, the difficulties and complications would be exceedingly great. Whatever might be said in disparagement of local authorities, he thought they were improving. But, as he had before hinted, the great thing was to educate the people themselves. There were many towns which had had good bye-laws for the last twenty or thirty years, but they had made no attempt to carry them out, because the public were not educated up to them. He did not think it would be possible to frame a statute which would meet the requirements of the whole of the country, and therefore recourse must be had to bye-laws, which should be amended or renewed from time to time, as might be found desirable.

Mr. T. Roger Smith, Fellow, said that he had never so fully appreciated the desirability of a General Building Act for the United Kingdom as he did at that moment. However, after what had been said by Mr. Ellice-Clark, who was so well acquainted with the operation of bye-laws, he thought it was quite clear that the general run of the building regulations in the Model Bye-laws were above the heads of the public, who undoubtedly wanted educating on those points. It was useless to expect that town councils and borough authorities could do much, however willing they might be, to enforce building bye-laws; and he had been somewhat reluctantly led to the conclusion that further and compulsory legislation on the subject was necessary. He was quite sure, however, that any compulsory legislation on the subject would be more likely to exceed than fall short of the stringency of the provisions of the Model Bye-laws. He had had occasion to go carefully through that portion of the Model Bye-laws which dealt with buildings, and he must say that his experience as a district surveyor did not lead him to regard them as being of such undue stringency as Mr. Ellice-Clark had suggested. Taken as a whole, he thought their requirements were reasonable, and if they were generally adopted people would soon get out of their bad methods of building. He was surprised to hear Mr. Ellice-Clark speak of the bye-law which prohibited the insertion of timber in party-walls as a hardship. Any one who had had much to do with old property would fully appreciate the necessity of such a provision. As a case in point, the buildings on Adelphi Terrace were a year or two ago falling to ruin, simply owing to timber having been built into the party-walls, and many thousands of pounds had been spent in reinstatement. However thick the party-wall, timber should not be built in it. If ever a Building Act were passed for the entire kingdom, the less minute its regulations the more likely was it to be efficient and workable. The more it dealt in broad, general principles, the more it confined itself to laying down leading rules, avoiding *minutiæ*, the better would it be. That such an Act was wanted was proved by the speech of the last speaker.

Mr. Campbell Douglas, Visitor, said that in Glasgow the subject was just now engaging much attention. The municipal authorities were trying to get additional powers for the Dean of Guild Court, but they had not shewn their wisdom by neglecting to consult, and thereby ignoring, the architects and surveyors of that city. He was glad to find that the Royal Institute of British Architects had been recognised and consulted by the Local Government Board as to the formulation of the Model Bye-laws. As to depositing complete copies of plans with local officers, architects had to do it in Glasgow; they felt it to be a very great hardship, and for large works it entailed a very considerable expense, which was not recouped. As to the improper use likely to be made of drawings so deposited, it was not always possible to obtain legal proof of an offence, even if there was reason to suspect one.

Mr. Lynam, Visitor, said that for something like twenty years he had occupied the position of town surveyor, and for about half that period he had been in the habit of receiving plans from architects and builders who submitted them for examination; but he could not in any way endorse Mr. Ellice-Clark's remark that the plans which were submitted by builders were more practical and understandable than those submitted by architects. On the contrary, it was his experience that builders' plans were, as a rule, very imperfect and unsatisfactory, and it was often utterly impossible to make them out at all. He thought Mr. Ellice-Clark was under a misapprehension when he said that the Model Bye-laws compelled private property-owners to give up their land for public improvements without compensation, because, although the Bye-laws compelled the setting-back of property when rebuilding, there was no bye-law that he knew of which compelled the property-owner to surrender the land; he could still fence it in or enclose it. He, as an old town surveyor, agreed with Mr. Roger

Smith in thinking that the Model Bye-laws, as a whole, were not unworthy of adoption, but he could not see his way clearly to speak in favour of a General Building Act for the country at large. It might be inferred from Mr. Ellice-Clark's observations that building bye-laws were exceptionally difficult to carry out in the Potteries, but such was not the case.

Mr. MATTHEW ALLEN, Visitor, said that he had had many years' experience as a practical builder, and he quite agreed with the advisability and, indeed, absolute necessity, of excluding timber from all walls, whether "party" or external. He had, in order to clear the site for some large blocks of workmen's dwellings he had erected, pulled down a great deal of small property in the neighbourhood of Finsbury; he had found the timber embedded in the walls to be completely rotten, and the walls were thereby rendered unsafe. From the very moment that the timber was embedded in the walls, decay commenced. For his part, he would have no wood at all in the carcass of a house. It would be a very great advantage, and one well worthy of the support of architects, if in any future Building Act there could be inserted a provision prohibiting altogether the use of wood in the carcasses of houses. As to drainage, he thought it ought never to be carried under houses. He had read through the Model Bye-laws, and, speaking as a practical builder, he could not see anything very objectionable in them.

Mr. JOHN HEBB, Associate, said that he thought Mr. Ellice-Clark had somewhat misapprehended Mr. Chatfeild Clarke's remarks in objection to that portion of the Model Bye-laws which provided for the depositing of plans with local officers. What was felt was that the requirement was unreasonable and unnecessary, and was likely to lead to abuses. Architects' drawings deposited at public offices passed through many persons' hands, and were in some cases liable to be "hawked about" and perhaps copied. He (the speaker) could not admit that the requirements of the Model Bye-laws were too severe. On the contrary, he thought they were too lax in some respects, and it was desirable that they should in particulars be made more stringent. It was impossible to discuss the Model Bye-laws in detail at that Conference—that could better be done in committee—but with regard to the general principles which should underlie the making of bye-laws, he thought some determination might be arrived at, and that these Bye-laws should be as few and as simple as possible. He also agreed in thinking that there should be the smallest amount of dispensing power in the hands of the administrative body. A large proportion of the difficulties with regard to the administration of the Metropolitan Building Act arose out of the dispensing powers which had been given to the body charged with its enforcement. There was a great tendency to strain those powers, sometimes unduly. It would very much strengthen the hands of officers charged with the administration of Building Acts if there were no dispensing powers—in other words, if the requirements of the Act were absolute. He was surprised to hear Mr. Ellice-Clark defend the practice of building the ends of timbers in party-walls, for it was a fruitful source of danger in buildings, as all district surveyors knew by experience. On the whole, it could hardly be said that the Model Bye-laws erred on the side of excessive stringency.

Mr. J. RAWSON CARROLL, Fellow, said that he was not quite sure whether it was intended to apply the Model Bye-laws to Ireland, but if such was the intention, they would require certain modifications in many points in order to be reconcileable with the modes and requirements of Irish building and with the materials available. In Dublin, nearly all foundations were of stone, and therefore it would be necessary to materially alter the dimensions laid down in the Model Bye-laws for foundations.

Mr. ARTHUR CATES, Fellow, said that many of the speakers appeared to be under the erroneous impression that the Model Bye-laws as issued by the Local Government Board were to be taken to

include the entire wishes of the Board and its advisers, with respect to building and sanitary regulations. It should be borne in mind that the Model Bye-laws had been prepared under considerable difficulties and restrictions. It would have been useless, and foolish to boot, for the Board to have issued and recommended for adoption models for bye-laws which would be inapplicable or *ultra vires*. The Bye-laws as issued had been prepared under the 157th section of the Public Health Act, but it so happened that the powers conferred by that section were not so extensive as could be wished for the purpose of framing a code which should be complete and capable of general application. The Board had apparently endeavoured to make the Bye-laws as perfect as existing statutory powers would allow, and of course if the statute could be extended and improved, and more ample and sufficient powers thereby conferred on the Board, the Bye-laws could also be made more thorough and satisfactory. It was matter for consideration whether the Local Government Board ought not to be entrusted by Parliament with more extended powers with reference to the authorisation and confirmation of bye-laws, and the remodelling of those now existing. He regarded the Model Bye-laws as a first step towards the attainment of a General Building Act, whether framed on the broad general lines suggested by some of the speakers, or whether more in detail. The Local Government Board had neither expressed the intention nor had they the power of compelling the adoption of the Model Bye-laws, as they now stood, either as a whole or in part; they merely put them forward as a hint or guide to local authorities as to the points to be attended to in the framing of building and sanitary bye-laws, and there was no doubt whatever that in that way they would be of very considerable value. They were already being considered and adopted in various parts of the country, and could not fail to do a great deal in clearing the way for improved sanitary and building legislation applicable throughout the country.

Mr. CHARLES FOWLER, Fellow, said that Mr. Cates had rightly defended the Model Bye-laws as being framed under very limited powers. It had been assumed by one of the speakers that the imperfection of the Bye-laws, in some respects, was a thing for which the Institute was partially responsible; but that was not the case. The Institute had recommended a great number of improvements, and many of their suggestions had been adopted, while others were rejected for want of statutory power, and partly for reasons unknown to the Institute. It must be admitted, therefore, that the Model Bye-laws were not so perfect as architects could wish them to be. He had been astonished to hear Mr. Ellice-Clark, as the Local Board Surveyor of an important town, express his opinion that the Model Bye-laws were impracticable, on account of their alleged excessive stringency. The Institute committee charged with the consideration of the draft of the Model Bye-laws obtained a great deal of information from architects and local officers in various parts of the country, and they found the widest diversities in the requirements of local bye-laws, even in contiguous districts; there was a remarkable concurrence of professional testimony in favour of something like uniformity and consistency as to general principles.

Mr. T. H. WATSON, Fellow, said that while he was in favour of the limitation of dispensing powers in the administration of Building Acts and local bye-laws, he was not prepared to say that such dispensing powers should be altogether abolished; but whatever dispensing powers were retained might with advantage be taken out of the hands of the elective body.

The CHAIRMAN said that the Papers and the subsequent Discussion had elicited some good practical observations on the subject, which might, he thought, be again brought up for consideration at the next Conference. Mr. Cates had admirably explained the *raison d'être* of the Model Bye-laws, with which, as issued to the public, many suggestions offered by the Institute had been incorporated. The recommendations made by the Institute embodied the general opinions of architects throughout

the country. He entirely agreed with those speakers who advocated the reduction of the dispensing powers of elective authorities to the narrowest possible limits. At the same time, he did not see the practicability of abolishing dispensing powers altogether, for building was conducted under such varying circumstances that an absolutely rigid and fixed code of rules would be unworkable in all cases, except at great sacrifice. It was satisfactory to know that, in the Buildings Act Amendment Bill now before Parliament, the Metropolitan Board of Works had taken powers to make bye-laws which should clearly define what sites might be built upon, and in what cases concrete was to be laid over the site. Hitherto speculating builders had been allowed, without let or hindrance, to build houses on mud-shoots and all kinds of abomination. He agreed with all that had been said in condemnation of the practice of inserting timber in party or external walls. It had been incidentally suggested during the discussion that Model Bye-laws should, if possible, be framed bearing upon the vexed questions which arose as to light and air. Such questions were a source of abundant litigation and expense, and it would be very desirable for the Institute to direct its attention to the subject, with the view of seeing whether it were practicable to suggest any guiding rules or principles which might be of assistance in such matters. While the objections which had been made to the depositing of unnecessary plans were very cogent, it should at the same time be remembered that great inconvenience had arisen from the fact that under the Metropolitan Building Act there was no power to interfere with the internal construction of a house.

APPENDIX.

MR. HONEYMAN'S PAPER.

THE greatest care should be taken in framing a General Building Act to keep out all reference to sanitary matters, except such as are necessarily dependent on structural details. These, it will be found, are few, and can easily be defined. It would be the duty of the surveyor under the Building Act to see that they were attended to—the *sanitary* authority, as distinct from the *local* authority, should have nothing to do with it. The tendency is (especially in Scotland, where the existing Health Act is greatly inferior to the English Act) to confound the two, which would inevitably lead to confusion. For example, the Glasgow authorities are at present seeking to have it enacted, as an addition to their present building regulations, that no room in a domestic building shall have less than 10 feet height of ceiling. Now, this is utterly absurd as a building regulation. If such regulations as Nos. 55 to 58 of the Model Bye-laws are attended to, a house may be as healthy with even 8 feet of ceiling as with 10 feet, *if, after it is built*, the officers under the Public Health Acts do their duty, and prevent overcrowding. People should be bound to erect houses with proper provision for light and ventilation, but arbitrary restrictions, which have no necessary connection with the healthiness of the dwelling, should on no account be tolerated. I have repeatedly seen, both in town and country, two houses exactly alike so far as the building was concerned—built by the same builder and finished exactly alike, with high ceilings and windows and fireplaces in each room, presenting the most striking contrast in the matter of health, which no building regulations conceivable could have prevented, but which the provisions of a Public Health Act most certainly could. In the one you might find a man and his wife and a couple of children—everything bright, airy and wholesome. In the other, the same household, with the addition of four or five adult lodgers—the fireplaces, except in the kitchen, filled up with boards, and most probably papered over, and everything filthy, stuffy and stinking.

Can the Conference, backed up by the Institute, bring about either of the following practical results:—

1. Induce the Government (by memorial, deputation or otherwise) to take the matter up in earnest and give us a Building Act, pure and simple—suitable for both urban and rural districts—throughout the whole country (not forgetting Scotland)? Or, failing this
2. Can the Conference, or the Conference through the Institute, bring some pressure to bear upon local authorities promoting private bills, dealing with this matter, to induce them to take the advice of architects practising in their locality before deciding upon the details of their measure—or to take the advice of the Institute—or of local societies through the Institute?

If there is not to be a General Act, it is, I think, of the very first importance that the framing of numerous independent Acts should not be left in the hands of local authorities themselves. It might be expected that the authorities in such a city as Glasgow, for example, when desirous of obtaining new building regulations, would be glad to have the advantage of receiving the opinions of such men as compose the Glasgow Institute of Architects

—many of whom are, from their extensive and varied experience, well qualified to give most valuable advice. But what is the fact? Without giving the architects—or any other class of the community—any opportunity of discussing the detail, they, with unseemly haste, seek to get Parliamentary sanction to regulations of the most preposterous character (one of which I have already referred to) affecting vested interests and the value of property to a serious extent. The Glasgow Institute have of course protested against the course which has been adopted; but obviously, where they are ignored with such marked intention, they can hardly with dignity offer their advice. *Can the Conference do anything to convince self-sufficient corporations how senseless and detrimental to the interests of the community such conduct is?* Otherwise much mischief must soon be done if the regulation of buildings is to be left to private legislation.

140, *Bath Street, Glasgow.* JOHN HONEYMAN.

MR. BOULT'S PAPER.

BEFORE entering upon the consideration of the Model Bye-laws as a basis for a National Building Act, it seems desirable to cite a few principles, embodied in recent legislation, and which therefore may be accepted as axiomatic:—

1. That all trading operations should be subject to as little legislative interference as is consistent with the public welfare.
2. That it is desirable to have in force such regulations as will secure stability in buildings and reduce the risk from fire.
3. That it is also desirable to have in force such regulations as will secure those provisions for drainage, cleanliness, and ventilation which are essential to health.
4. That as the conditions under which buildings are erected vary indefinitely with the purpose, the site and the materials, legislative requirements should be as few and as elastic as is consistent with the securities referred to above; and that imperfections of language should be amended by a tribunal, having also discretionary power to relax provisions, the purpose of which is otherwise attained.

Other principles, which are not so axiomatic and require some explanation, are:—

1. That the experience of what are called model lodging houses, in London and other large towns, combined with that of barracks, workhouses, and schools, furnishes abundant evidence, that "density of population" is not so detrimental physically as has been hastily assumed; because, in such buildings as are referred to, the rate of mortality is much less, with a density of 1500 persons to the acre, than it is in ordinary small houses, with a density of only 250 to the acre.
2. That the health of a community is more dependent upon food, clothing, and personal habits than upon the arrangements and construction of dwellings or workshops: for, however perfect may be the arrangement and construction, they may be entirely neutralised if the food is bad, the clothing deficient, and the personal habits filthy. It not unfrequently happens that men, women and children will search heaps of garbage for fish, bread, vegetables, fruit and other edibles; and will greedily seize and devour what they find, though in an advanced state of decay.

   Recently some coalheavers were observed to scale a wall and ransack a manure wharf, where was temporarily deposited some fish, which had been seized and condemned as unfit for food by the sanitary authority; and not only may numerous dogs be found in the small apartments occupied by a family, but also in many houses, pigs, poultry, and even horses, which feed from the same dishes and impart their own special diseases and parasitical companions.
3. That the measure of sanitary regulation, absolutely necessary, is to be sought in those buildings in which the arrangements of all kinds are of the simplest or rudest description consistent with shelter; the test being afforded by the rate of mortality as compared with that in buildings of the very best character for people of the same habits. For nearly forty years the writer's attention has been directed to the sanitary requirements of large towns, especially in Liverpool; and in 1867 he directed the attention of the sanitary authority of that town to a property known as Richmond Fair. Originally constructed for a cloth hall, like those in use in provincial fairs, the several shops or stalls, built round a hollow square, have been converted into dwellings, which, in the majority of cases, consist of one room only; they are arranged in two flats, access to the upper being attained by two staircases and covered galleries. A few of the upper houses have a second storey, and some of them have the advantage of a window front and back. The rents, he was informed, range from 1s. 9d to 3s. 1d. per week; the conveniences are in common, and the buildings generally in a dilapidated condition. One of the dwellings entered was occupied by a craftsman, who was out of work, who had tried "portering" (his wife said), but had not earned anything for some days. The dwelling consisted of one room only, say 200 feet in area and 9 feet high. The inmates were the man, his wife, a son of sixteen, and three young children. There was one bed, and those that could not be accommodated in that slept on chairs; the rent was 2s. a week. This seemed a fair sample of the bulk of the property, which consisted of eighty dwellings, and covered altogether about 2,200 yards of land. At the rate of five inmates to each dwelling, the total population

would be 400, or at the rate of 880 persons to the acre, or of 563,200 to the square mile—a density rarely exceeded. Yet, with all the disadvantages indicated above, and the absence of personal cleanliness, the writer was assured by residents that the general health is extremely good; one person said they never had cholera or fever, and people never die here except from old age. These reports of the sanitary condition of this property received general confirmation from the District Registrar, who said the mortality was very low, and chiefly confined to infants and old people; he thought there had been one death from cholera. Inquiry in the neighbourhood elicited that the conduct of the inhabitants was very good.

Observation leads the writer to believe that this is not a solitary instance of the maintenance of good sanitary condition in densely peopled districts.

Most of the dwellings above referred to are built "back to back," abutting on the property of another owner, therefore the only space "uncovered by buildings" is the hollow square, from which it may be inferred that open space on more than one side is not *essential*, however desirable it may be. Many persons seem to think that a window front and back secures thorough ventilation; such an arrangement certainly secures a thorough draught, when both the windows are open, consequently they seldom are open at the same time. In fact careful observation shows that windows as a rule are rarely open, even in houses of the first class; and fireplaces, when not used as such, are frequently closed with a register or a chimney-board. The advantage of open spaces around buildings appears to be both over-estimated and misunderstood. A building at the corner of two streets is more favourably situated than another which has merely a frontage to one street with a small court and narrow passage in the rear; much more favourable is the position of a building which is bounded by three or four streets. To compel a part of the space so situated to be left unbuilt upon, will in many cases involve what appears to be the wanton waste of valuable property. If the area of uncovered space is in due ratio to the cube of building, its appropriation as street, square, garden in common, or otherwise, becomes comparatively indifferent, care being taken to prevent the space from being cut up into small, confined, neglected and dirty patches—the usual aspect of courts attached to small houses in towns.

If the space must be cut up, then it appears desirable to make the separate portions subsidiary apartments for cleansing purposes, covered over by a roof or upper storey, with as little enclosure vertically as is practicable. For, as respects the inhabitants of small houses in small streets, it may be observed, that, though they seldom open their windows, they usually keep the house-door open whenever the weather permits; and in Richmond Fair it is habitual to keep the door open even in stormy weather, the verandahs giving the needful shelter. It is of course very desirable that this mode of "keeping open house" should be encouraged, as the cubical capacity of the living room is thereby indefinitely increased.

4. The prejudice which prevails against water-traps, as a security against the escape of sewer-gas into houses, appears to arise from forgetfulness of the very obvious facts, that, in a well ventilated sewer, drain or pipe, the gas cannot accumulate so as to exert any pressure; and, that it is so diluted by admixture with atmospheric air as to be harmless. It is possible for the water actually in contact with the sewer gas to imbibe a small quantity; but the occasional change of the water in the trap will remove any injury from that cause. After having had daily experience for several years past of the use of several hundred water-traps by the tenants of an important estate, the writer is confident that a well constructed water-trap, if properly applied and protected by ventilation, is a perfect precaution against any danger or annoyance through the escape of sewer gas.

5. To a similar oversight must be attributed interruptions to the unbroken stream of drainage which are sometimes designedly introduced into drains—the danger of deposit, and of consequent local fermentation being disregarded. As fermentation does not usually commence until some hours after any substance has been exposed to the air, it appears obviously desirable that, where fermentation is to be avoided, the substances should be removed with the least practicable delay; consequently, that the connexion of drains of all kinds with each other, and with the sewer, should be as direct as possible, without the intervention of cesspools or even traps; and that in vertical pipes all traps should be placed as high as possible, so as to secure the greatest hydrostatic head and the utmost scour. Neglect of these provisions, and the adoption of unnecessary traps, from over anxiety to prevent the admission of sewer gas, have led to much annoyance and expense. It is clear, that in a drain, which is unavoidably almost level, any interruption, however trivial, weakens the scouring power of the stream; and favours the accumulation of sewer-silt, than which nothing can be more objectionable from a sanitary point of view. All such deposits are most favourable for the evolution of gas and the growth and propagation of germs.

The great annoyances which sometimes arise from drainage, as at present constructed, appear due more to the negligent way in which the work is usually executed, than to the arrangement and position of the drains themselves. It is desirable, that every part of a system of drainage should be accessible in the readiest way practicable, so that defects may be easily remedied and additional drains connected with it at the least expense and trouble. It is probable that the imperfections arising from slovenly workmanship would be

prevented, if no one were allowed to lay drains unless licensed for the purpose by the sanitary authority of the district; and by subjecting all persons so licensed to penalties for defective work, whether arising from the materials or the labour. In this way the men employed would be responsible for the proper construction of the drains according to the plan laid down for them.

6. Local Boards usually require the deposit of one or more of the drawings of a new building—in some cases they are very exacting in this respect. This requisition is open to grave objections, as disclosing the internal arrangements, which, in various factories, is detrimental to the proprietors; and as tending to deprive the architect of his *quasi* copyright in the design, drawings and specification. It is difficult to see in what way the sanitary authority is benefited by such injurious demands. Cases have occurred, in which the drawings required have been deposited, and found to be in accordance with the regulations of the local authority, but in which the buildings have proved to be not in accordance with the same regulations—the deviations not having been detected until the buildings were approaching completion. The deposit of drawings, then, appears to have the effect of beguiling the surveyor into false security, and of preventing that watchful inspection which is often very essential. That the plans of drainage should be submitted for approval is in many cases very desirable, as modifications in the system may be suggested and adopted with advantage; but it is otherwise with the general distribution of space throughout the structure; for in that the proprietor, or vendor, according to the received principles of trade, must be presumed to be the best judge. Of course the regulations or bye-laws of the district must be enforced; but that can be done most effectually in the structure, in which deviations from the bye-laws, that is, their evasion, is most likely to be attempted.

7. The experience acquired under the Metropolitan Building Act appears to show that its provisions are better enforced by practising architects than by surveyors appointed for that purpose exclusively; and it seems very desirable, that the system of supervision which has prevailed for so long in the Metropolitan districts, should be extended throughout the country. In rural districts, where the amount of building is very limited, and architects are but sparsely scattered, it is probable that two or more Local Boards will appoint the same architect their district surveyor. In this way the Boards would secure the assistance of men of superior intelligence, and, probably of more honourable character—both qualifications essential to the impartial and reasonable execution of statutable enactments.

It has appeared to the writer that for the purpose of a Conference it was preferable to propound general principles, which should govern the compilation of Bye-laws for the regulation of building, than to enter on a discussion of the model which has been issued by the Local Government Board. When the principles are established it ought not to be impossible to frame a code which shall harmonize with them. A discussion of the Model Bye-laws themselves would involve a mass of detail which would prolong the discussion unreasonably and impracticably.

Anyone who will compare the principles enumerated above with the Model Bye-laws, cannot fail to see that they are utterly irreconcileable with many of the provisions in the latter. The defects of the Model Bye-laws have been very fully considered by the Council of the Liverpool Architectural Society, and their objections stated in a report, dated 6th November, 1877.

That Report has been republished in some of the professional journals, and is probably known to many of those who attend the Conference. In the tenor of that Report, which he assisted to prepare, the writer wishes to express his concurrence.

D 17, *Exchange Buildings, Liverpool.* JOSEPH BOULT.

REPORT OF COMMITTEE ON GENERAL BUILDING REGULATIONS FOR THE UNITED KINGDOM.

In consequence of a Resolution (see page 277 ante) passed at the General Conference of Architects, on the 15th of June, 1876, a Committee was appointed, consisting of Messrs. H. CURREY, ARTHUR CATES, C. FOWLER, J. T. KNOWLES, J. HONEYMAN, J. DOUGLASS MATHEWS, J. WHICHCORD, with the President, Vice-Presidents, and Secretaries of the Royal Institute of British Architects.

Before entering on any detailed consideration of the subject, your Committee communicated officially with the various Architectural Societies of England, Scotland, and Ireland, requesting them to report thereon, and further invited, through the Institute Notice Papers and the professional journals, information on the same subject from individual architects.

By these means your Committee succeeded in collecting a considerable amount of information as to the nature of local Bye-laws, their advantages and defects in various parts of the country; and in comparing competent opinions on many points of importance in connection with this subject.

Your Committee also communicated officially with the Local Government Board in London, who not only expressed their willingness to consider any suggestions which might be made by the Committee, but also courteously supplied them with copies of Model Bye-laws lately drafted by the Board, which has greatly aided the Committee in their object.

From the reports of Provincial Societies, and from the opinions of individual architects, your Committee feel justified in stating that a remarkable unanimity of feeling exists as to the defects of the present system, and as to the measures required for its improvement.

The local authorities who have the control of building regulations are now very numerous, and the regulations themselves so varied and in some instances so complex in their nature, including as they do many conditions which appear unnecessary and even impracticable, that they may fairly considered as inconvenient and oppressive to all concerned in building operations.

For example, it may be mentioned that within a radius of 20 miles from the Liverpool Exchange there are 34 Corporate and Local Boards, or Improvement Commissions, of which 12 are within an area of 60 miles, and of that area a considerable part is outside the limit of those several authorities, and consequently is not under any supervision at all so far as building is concerned. As a remedy for such evils the advantage to be derived from an uniform code of building regulations is strongly urged on all sides, and it is obvious that if such a code be established and recognised by law it should have the fullest range, and should not be limited in its scope, as proposed, to the terms of the Public Health Act by a strict interpretation of its 157th Section. With the exception of this unfortunate limitation, which is greatly to be regretted, your Committee desire to express their high approval of the manner in which the Model Bye-laws have been drafted by the Local Government Board, and they feel confident that if that limitation could be removed a code of building regulations might readily be framed which should be of universal application and thus secure complete uniformity of rule throughout the kingdom.

At present the regulations respecting buildings are affected not only by special local acts and the bye-laws of each district, but also by the Public Health Act, the Towns Improvement Clause Act, the Chimney Sweepers Act, &c. It appears that under the present system these regulations and enactments cannot be comprised within the bye-laws authorised by the Public Health Act, and confirmed by the Local Government Board ; but they should certainly all be set out at length either as notes to such bye-laws in the form of appendices thereto.

It is essential that all building regulations, whether of a sanitary or practical nature, should be codified and ultimately comprised in a single document, having the same legal authority in the provinces as the Metropolitan Building Act has in London. All previous legislation, whether of a public or local character, and all these existing bye-laws, would be repealed or would be superseded, and a definite and uniform system would be established throughout the country.

The Select Committee of the House of Commons, which reported in 1867 on the prevention of fire, recommended the adoption of a General Building Act for the whole kingdom, and the Model Bye-laws prepared by the Local Government Board may fairly be considered as the first step towards that very desirable object.

Your Committee, having carefully examined and discussed those bye-laws in detail, have noted on the margin certain alterations and suggestions which they believe might be adopted with advantage. These notes will render any detailed report unnecessary. It may, however, be well to mention that the addition which they have ventured to make to Bye-law 10 is intended to provide for cases in which there have been considerable depth of filling in, when the literal restriction imposed by that bye-law as originally drafted would be oppressive.

The sub-sections relating to hearths, &c., appended to Bye-law 48, are in the opinion of your Committee absolutely essential to secure adequate protection from fire, and their adoption is on that account earnestly recommended. For obvious reasons it would also seem desirable to introduce some provision for regulating the scantlings of timber used in construction, and for empowering the local authority to deal with dangerous structures, as is the case under the Metropolitan Building Act.

Your Committee further suggest the importance of defining as far as possible the relative rights and obligations of adjoining owners in regard to party structures, and with respect to the alteration of existing structures ; and seeing that the bye-laws as at present framed apply only to new buildings defined by Section 159 of the Public Health Act, it is submitted that the regulations should be framed in such a manner as to secure their enforcement in regard to buildings already erected, and to prevent evasions after new buildings have been nominally completed. This object would perhaps be sufficiently attained by the adoption of Section 9 of the Metropolitan Building Act of 1855. In order to secure the complete supervision of new buildings and alterations to old ones, and with a view of securing the observance of the Bye-laws generally, a system should be adopted by which fees might be paid to the local authority, and be recoverable from the builder or building owner, on the completion of the work, and after it has been inspected by the local authority or his officer. The expense of this supervision would thus be borne by the building owner, and would not be a charge on the local rates.

It is not desirable that any discretionary power to depart from a literal interpretation of the Bye-laws should be vested in any local authority as this would tend to diminish the advantage derived from their general adoption, and

might afford opportunity for the exercise of personal influence. Uniformity of administration and interpretation (where doubts arise) could only be secured by the constitution of some Central Authority as a tribunal of reference to which all appeals against the acts of Local Boards should be referred, and in which alone all discretionary power should be vested.

It has been represented to your Committee that the Local Boards in framing these regulations for the guidance of builders sometimes introduce requirements not authorised by the Bye-laws. The Central Authority would take cognisance of such cases and require the regulations to be brought into conformity with the law.

Evening Meeting: GEORGE GODWIN, F.R.S., Past Vice-President in the Chair.

CONCRETE AND FIRE-RESISTING CONSTRUCTIONS.

(Notes to Open a Discussion.)

By ARTHUR CATES, Fellow.

IN the first volume of the Transactions of the Royal Institute of British Architects, published in 1836, there appears a Prize Essay upon "The Nature and Properties of Concrete, by George Godwin, jun., Associate," which is the foundation of all that has since been done in relation to this subject. In more recent years, the attempts to use cement concrete as a building material for ordinary constructions, (in many cases attended with remarkable success), required consideration; and on June 5, 1871, Mr. Thomas H. Wonnacott, in a Paper "On the Use of Portland Cement Concrete as a Building Material," fully described the advance which had been effected; Mr. A. W. Blomfield at the same time contributed "Remarks on Concrete Building." The continually increasing importance of the subject lead to its being further considered in 1876, when, on April 10, Mr. Alexander Payne, read before the Institute a Paper on "Concrete as a Building Material." In this Paper, and the succeeding exhaustive Discussions, continued on May 15 and May 29, a large amount of valuable information will be found.

The advance that has continued to take place in the application of concrete, and the importance that attaches to an interchange of opinions and experiences of its use, have induced the Council to select the subject for consideration this evening.

In the Discussions referred to, numerous instances of remarkable success were given, especially in the construction of floors, such as plate floors, 12 ft. 6 in. by 11 ft. 6 in., of a uniform thickness of 7 in., bearing $4\frac{1}{2}$ in. on walls, without girders, iron or other supports; a plate floor, 20 ft. by 15 ft., 6 in. thick, loaded with 2 cwt. to the foot, without deflection; a balcony, 50 ft. long, 4 ft. projection from the wall, 11 in. thick at the wall and 3 in. thick at the outer edge, supported merely by the adhesion of the cement to the wall, &c. &c.; and the success which had attended these bold experiments led to the anticipation that even more striking successes might be obtained. Should time permit after the Discussion of the more important section of the subject—Fire-resisting Constructions—it is to be hoped that full advantage will be taken of this opportunity, and the results of experience since 1876 be freely communicated, not only with regard to such exceptional feats, but especially with relation to—

The formation of walls for ordinary constructions, whether solid, or packed with large fragments in the interior.

The use of iron bond or ties in particular situations.

The homogeneity of concrete structures: their liability or otherwise to vertical fissures, or splitting up into sections.

The damp-resisting qualities of different descriptions of walls; the conditions under which they are weatherproof without external rendering.

The liability in certain atmospheric conditions to condensation of moisture inside the building.

The sonority or resonance of such structures; if any inconvenience is found to arise from the free conduction of sound, more particularly where the walls, floors and roofs are constructed of concrete; and details of the remedies found to be effectual.

The adoption of any less expensive material than Portland cement, such as Selenitic lime.

The external decoration of the wall surfaces, &c.

Ascertained facts as to the comparative advantage of different kinds of apparatus, and cost of works.

The other branch of the subject for consideration—Fire-resisting Constructions—has, since 1854, when the French systems and Fox & Barrett's patent were discussed, been frequently considered by the Institute. Professor T. Hayter Lewis, in a Paper read April 3, 1865, summarized preceding experiences; and from them the following conclusions were drawn:—

1. Iron is unsafe owing to the risk of fracture, and the loss of strength attendant upon great heat.
2. Stone and other substances known to be incombustible are not therefore fireproof, but on the contrary their use as they are commonly applied is often the source of great danger.
3. Concrete in which siliceous material is used is readily destroyed by fire; fire-resisting capability can only be attained by the use of material which has already been calcined, such as clinkers, broken brick, broken pottery, stamped or ground up, and similar material.

The subject was further considered at the Conference Meeting of May 25th, 1871, in the Discussion following Papers read by Professor Lewis and Mr. Charles Fowler, and in the published reports of these proceedings valuable details will be found.

Since this period very great attention has been devoted to the subject, and it may suffice on this occasion if I briefly refer to those few systems which appear to me to be most worthy of consideration.

Of the patents referred to, which are mostly illustrated by diagram, I have presented copies to the Library of the Institute, where they may be referred to; they will, I hope, form the nucleus of a large collection of documents bearing on this subject.

Mr. Matthew Allen, in his patent for Fireproof Buildings, dated January 30, 1862, had described his improved method of making fireproof buildings by the combination of cinders, slags, coke clinkers, or other calcined substances, with Portland or other cement; and he has largely carried out this principle in the lintels and stairs of the numerous buildings in the erection of which he has been concerned. His material was subjected to a severe test in 1871, when a six-storey building erected for Messrs. Waterlow & Sons in Hill Street, Finsbury, was partially destroyed by fire. In this building his improved concrete had been used for lintels over double iron doors, in party walls, and over all door and window openings; by the fire the iron doors, columns, girders, floors and roofs, and all the ordinary stonework, were destroyed, and even the granite paving of the courtyard was considerably damaged. York landings, 3 ft. by 8 ft. and 6 in. thick, forming the sills under the iron doors, were *entirely* destroyed, while the concrete lintels above, which had been exposed to a much fiercer heat, were quite unhurt.

This remarkable success led to the adoption of this material on a large scale in the new buildings erected by Messrs. Waterlow, where the floors are formed of concrete 7 inches thick, and all the girders and ironwork of the floors are enclosed in this material.

Concrete thus prepared has not only great fire-resisting power, but it is otherwise strong. Mr. Allen having used it for templates, bases, &c., and using 5 parts of clinkers to 1 of cement, he has found templates 18 inches square support a load of 170 tons without perceptible effect.

For ordinary purposes Mr. Allen uses a proportion of 8 to 1, or where greater strength is required, 6 to 1. He also recommends that the bottom flanges of all girders should be bound round with wire and covered with the material to protect them from fire; and that pieces should be cast to fit round columns, or iron wire being bound round to form a key, the material should be worked round in the ordinary manner.

The necessity for efficiently protecting the iron beams which constitute the element of strength in ordinary floor constructions, although so clearly demonstrated in 1865, did not, as far as I am aware, receive a *practical* application till about 1873, when Mr. John Whichcord, at the National Safe Deposit Company's Building, Queen Victoria Street,—having for the exterior selected "Minera" stone, as a sandstone promising satisfactory fire-resisting power,—next proceeded to devise a really fireproof floor; and as the requirements of the superstructure did not admit of any internal wall, and the points of support by columns were limited to two or three, there was no alternative but to employ iron girders for supporting the arches of the floor. To protect these from the action of fire, Mr. Whichcord devised a fire-brick and clay casing enclosing the flange, and by actual experiment (detailed in his Paper read January 17th, 1876) on a girder 14 ft. 9 in. span the protection was found to be sufficient, the girder so protected resisted fire for long periods, remained uninjured, and was used in the building. The iron columns were protected in a similar manner, and thus the first practical step to the production of a really fire-resisting structure was made.

Mr. Lewis Hornblower, of Liverpool, has patented in 1871 and 1873 a system, which appears in drawing to be somewhat complex, and which he calls the "Cellular Terra Cotta Fireproof Girder Floor," in which the rolled iron joists, about 2 ft. apart, are cased with hollow skewback springing tiles of fire-clay filled in with concrete, the interspaces being filled in with hollow voussoir shaped tiles, and the whole floated in with liquid cement or concrete. This system has recently been adopted by Messrs. Pennington and Bridgen in the erection of the Manchester Pantechnicon. A model of the construction of one compartment is on the table; and for a room 24 ft. by 24 ft. the cost is stated to have been 25*s.* per square yard. A similar floor at the Liverpool Corn Exchange, 27 ft. 6 in. span, cost 32*s.* per square yard, fixed complete. I understand, also, that Mr. Honeyman has used this floor in some four instances at Glasgow.

In 1876 Mr. Northcroft obtained a patent for a more elaborate system by which all girders and joists would be completely encased in fire-clay tiles or blocks, and the interspaces filled in with similar tiles or blocks voussoir shaped and joggled together in such a manner as to form a flat soffit and upper surface.

The protection of columns is not less important than that of girders, but beyond the suggestion of Mr. Allen, and the actual work of Mr. Whichcord as before mentioned, they appear to have been in some degree neglected by inventors; in 1877, however, a patent was granted to Mr. Lake on a communication from Messrs. Drake and Wight, of Chicago, for the protection of iron columns against the effects of fire and the effect of water on heated iron columns in burning buildings, by surrounding such columns with fireproof gores of terra-cotta, concrete blocks, or other non-conducting material forming an annular exterior, filled in and grouted with cement; this appears to be very much what was done by Mr. Whichcord some four years ago.

To illustrate the slowness with which knowledge of the first principles of fire-resisting construction has spread, and the absolute necessity for the subject being considered and discussed at meetings such as this, I may refer to a patent obtained in 1876 by a gentleman describing himself as an engineer "for improvements in the construction of fireproof and other buildings"—consisting of the formation of the floor arches as three sides of a polygon, in place of circular segments, his

illustrative diagram shewing the *exposed bottom flanges* and *tie rods*, which render such construction anything but fireproof.

These few instances hardly illustrate the energy with which inventors have recently turned their attention to fireproof structures, about as many as 80 patents having been granted in the last five years as so bearing on the subject; the majority, except those I have mentioned, and those of Mr. Brannon and Mr. Hyatt, being of very small importance. Many hope to obtain success by the circulation of water through hollow walls and floors. Others by making the roof and floor shallow tanks ever ready to discharge their contents on all below; by providing every compartment of a building with a central rose, connected with a large reservoir; by perforating the entire ceiling and connecting it with a water tank; or by perforated tubes connected with the street mains and distributed over the building in such positions as to command the whole or any part, and on the occurrence of a fire to automatically bring the water to bear upon it—but all these devices are foreign to the subject for consideration this evening.

Among the active patentees, Mr. Philip Brannon deserves special mention. His inventions all merit careful consideration; the successful experiments in which buildings constructed of his material have resisted fire, and its apparent non-conducting powers, are probably familiar to all. The application of concrete in the form of so-called "stone felt" to the production of doors appearing likely to form far more efficient protection from fire than has been obtained by the familiar iron door, deserves more attention than it has received; and the application of the same material for the protection of that portion of the timber framing of the cupola of St. Paul's accessible to visitors, and which has been inspected this week by the Members of the Conference, reflects great credit on Mr. Penrose for having adopted it, and on Mr. Brannon for having so well carried out the work.

Mr. Lascelles is also working in the same direction, or rather is advancing far beyond what has hitherto been done; and as a result of the endeavours of these gentlemen we may now erect a comfortable residence, in which combustible material even in the fittings shall be the exception—the *joinery, doors, window frames* and *all*, being in concrete.

The inventors who have taken up this subject appear in many instances to be merely groping their way, and it is but seldom that their patents are the results of, or are supported by, well-considered and systematic experiments; and to this deficiency of scientific application the slowness of the progress hitherto made may be mainly attributed.

However, the most recent and in some respects probably the most important contribution to the literature of fire-resisting construction, is the well illustrated volume printed last year for private circulation by Mr. Thaddeus Hyatt, whose lens-lights and pavement illuminators are so well known, and who has obtained a large number of patents relating to the subject. This essay is entitled—"An Account of some Experiments with Portland Cement Concrete, combined with Iron as a Building Material, with reference to economy of metal in construction, and for security against fire in the making of roofs, floors, and walking surfaces. By Thaddeus Hyatt."

Commencing by a review of the systems of so-called fireproof constructions as illustrated in Fairbairn—"On the application of cast and wrought iron to building purposes," 4th edition, 1870—Mr. Hyatt repeats what has been thirteen years ago urged in this room, that the original mistake as to the ability of naked iron to resist heat and flame has vitiated every floor construction of the kind. Leaving out of account the unprotected iron columns on which the girders rest, the bottom flanges of all the girders are naked and exposed to flame; this flange being the tie, the integrity of the whole beam is dependent on it. Soften the tie by heat, the resistance of the beam begins to give way, and the destructive influence of combined load and flame act till the beam is destroyed. He thus arrives

at the conclusion already attained by Whichcord, Hornblower, and others, that fireproof floors cannot be made if the bottom flanges of the beams are left exposed or too lightly covered.

To make fireproof floors it is necessary to know the law of heat conduction, with respect to the material relied upon to protect the bottom flanges of the beams, in order to calculate the thickness of material needed to give protection during the hours determined on as the limit of time for the fireproof capacity of the floor; in a floor where the sole or main reliance for strength is in iron, the first thing to be done is to protect it with a fireproof coating on all sides sufficient to give it a power of resisting fire during the number of hours required.

In the Lens-light Works, Farringdon Road, an experimental building for the display of his inventions, and well deserving of a visit, Mr. Hyatt has introduced the construction shewn on diagram A. The main girders rest on the walls; to the undersides of the bottom flanges are

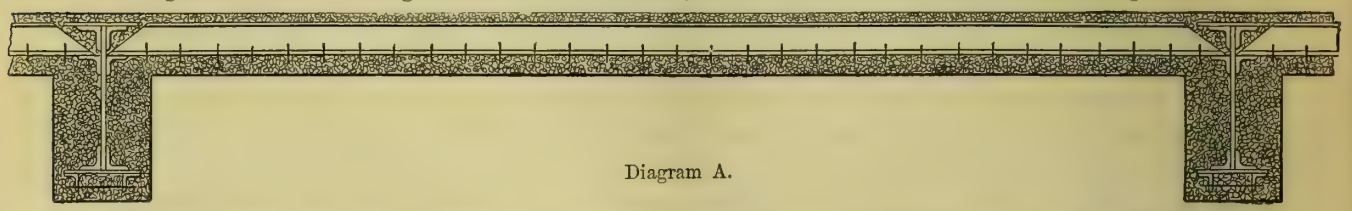


Diagram A.

riveted angle irons, which carry $\frac{1}{4}$ in. wires and cross wires to hold the fireproofing material, by which the girder is entirely surrounded.

B, C, D, show the details of the construction of the floor, and the light timbers laid on the concrete ceiling to receive the floor under.

Diagram B.

Diagram C.

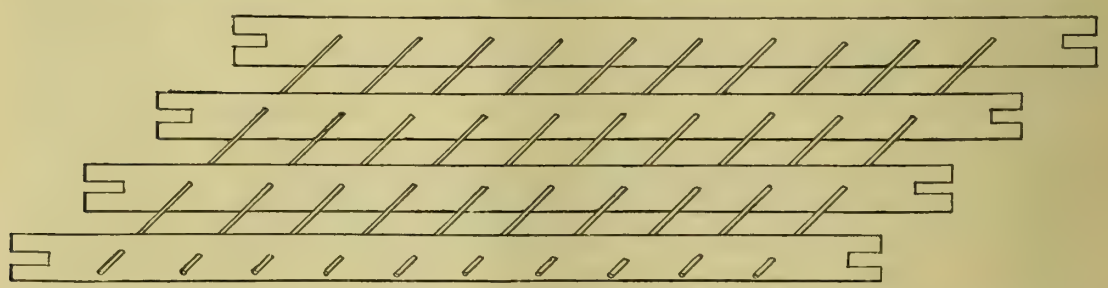


Diagram D.

E, shows another form of construction, where flat iron ties $2\frac{1}{2}$ by $\frac{1}{4}$, and 6 in. apart are substituted for the floor joists.

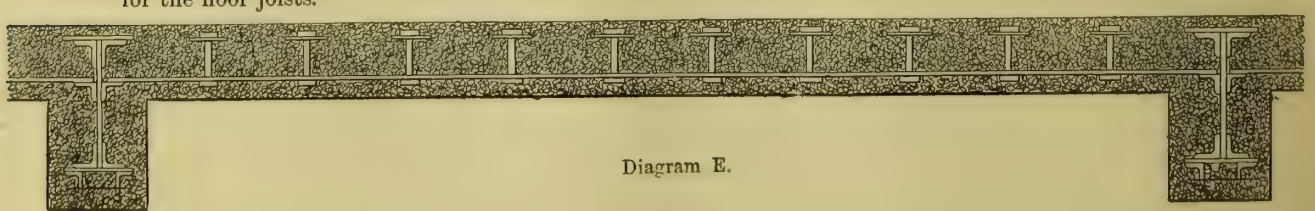


Diagram E.

F, G, H, represent floors 20 ft. span. F and G, with box girder, 12 ft. apart. H, with rolled beams, 6 ft. apart.

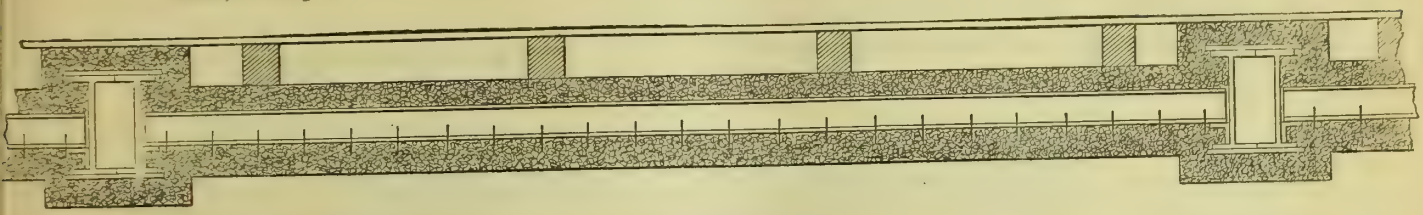


Diagram F.

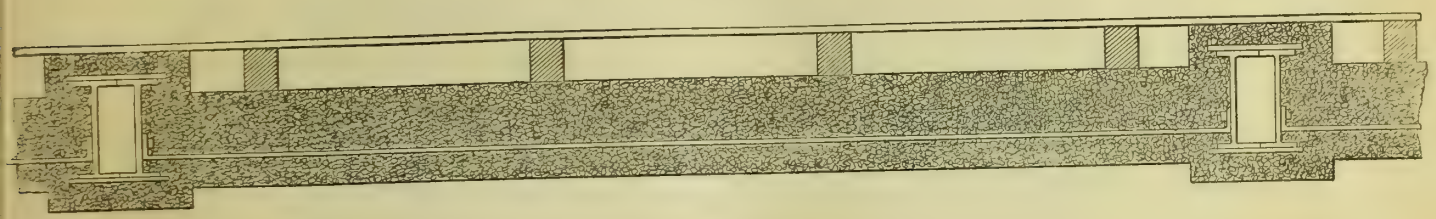


Diagram G.

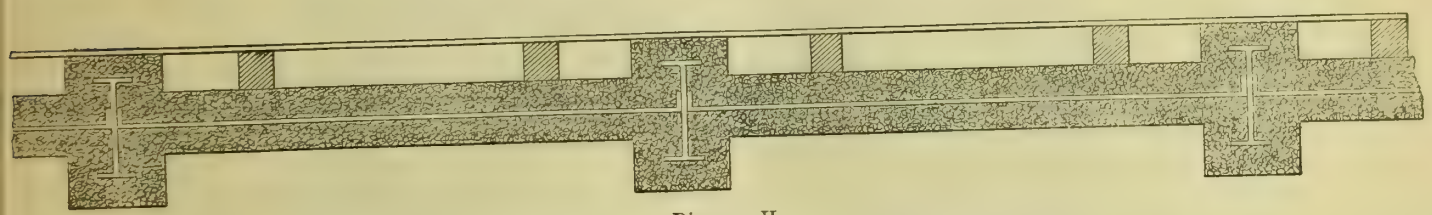


Diagram H.

With regard to the fire-resisting capabilities of Portland cement concrete, experiments were made with brick-shaped blocks, composed of one cement to two of crushed bricks. At one month old, when heated to redness for six hours in a furnace, taken out and partially plunged into water, the end that came in contact with the water fell instantly to pieces and disappeared; similar blocks heated in the same way, and left to cool in the open air, became disintegrated within periods varying from 6 to 48 hours, the results being uniform as to samples that had been exposed to the same degree of heat and for the same length of time.

With a view to reduce the amount of iron in the construction of a floor, Mr. Hyatt proposes to utilize the power possessed by concrete of resisting compression in combination with the tensile force of iron, by omitting the web and upper flange of the iron beams usually employed in floor construction, and leaving only a tie bar 2 by $\frac{1}{4}$; and a series of experiments on concrete beams made on this principle, and varying in weight from 200 to 900 lbs. each, the bearing being 5 ft., appear to confirm his theory; about fifty such beams were broken by Mr. Kirkaldy, and the results appear to show that the iron was perfectly held while the beam was under strain, that the two materials worked in perfect harmony, and that the union of tie metal with concrete equalled in strength riveted or rolled beams.

C C C

Not finding satisfactory results from the use of ordinary cement, Mr. Hyatt, having invented an improvement in the manufacture of Portland cement which increased its fire-resisting capabilities, used such new cement in the under-mentioned experiments.

To ascertain the length of time required for heat to penetrate concrete layers of different thicknesses, a furnace was built as shown in diagram K : the top of the furnace consisted of a slab

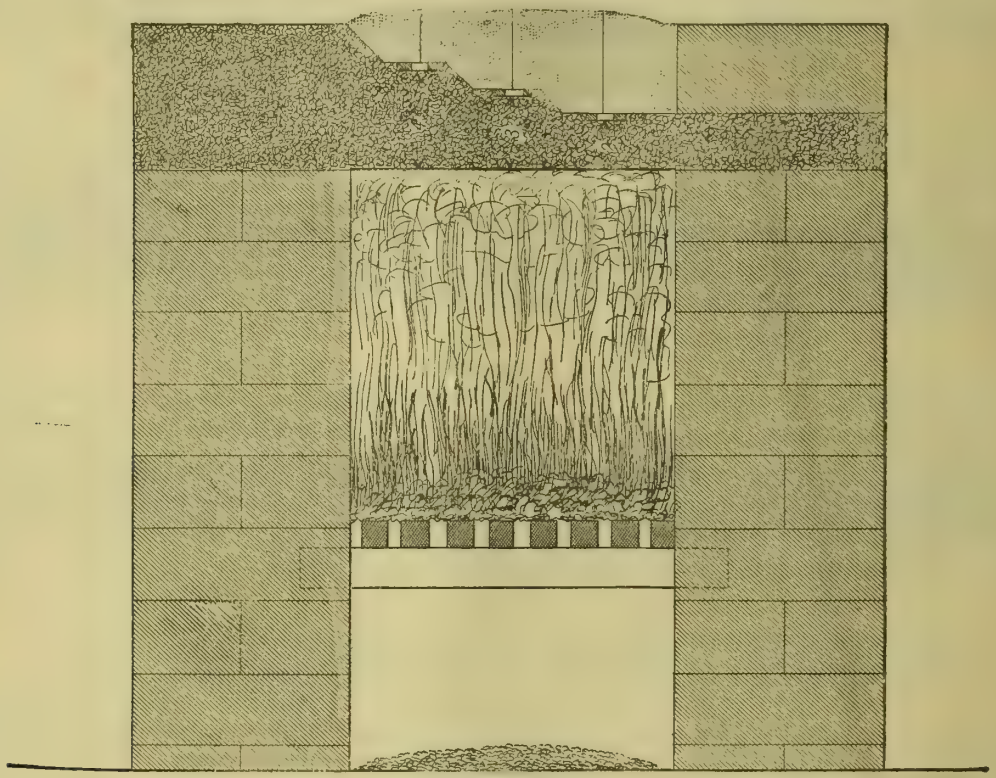
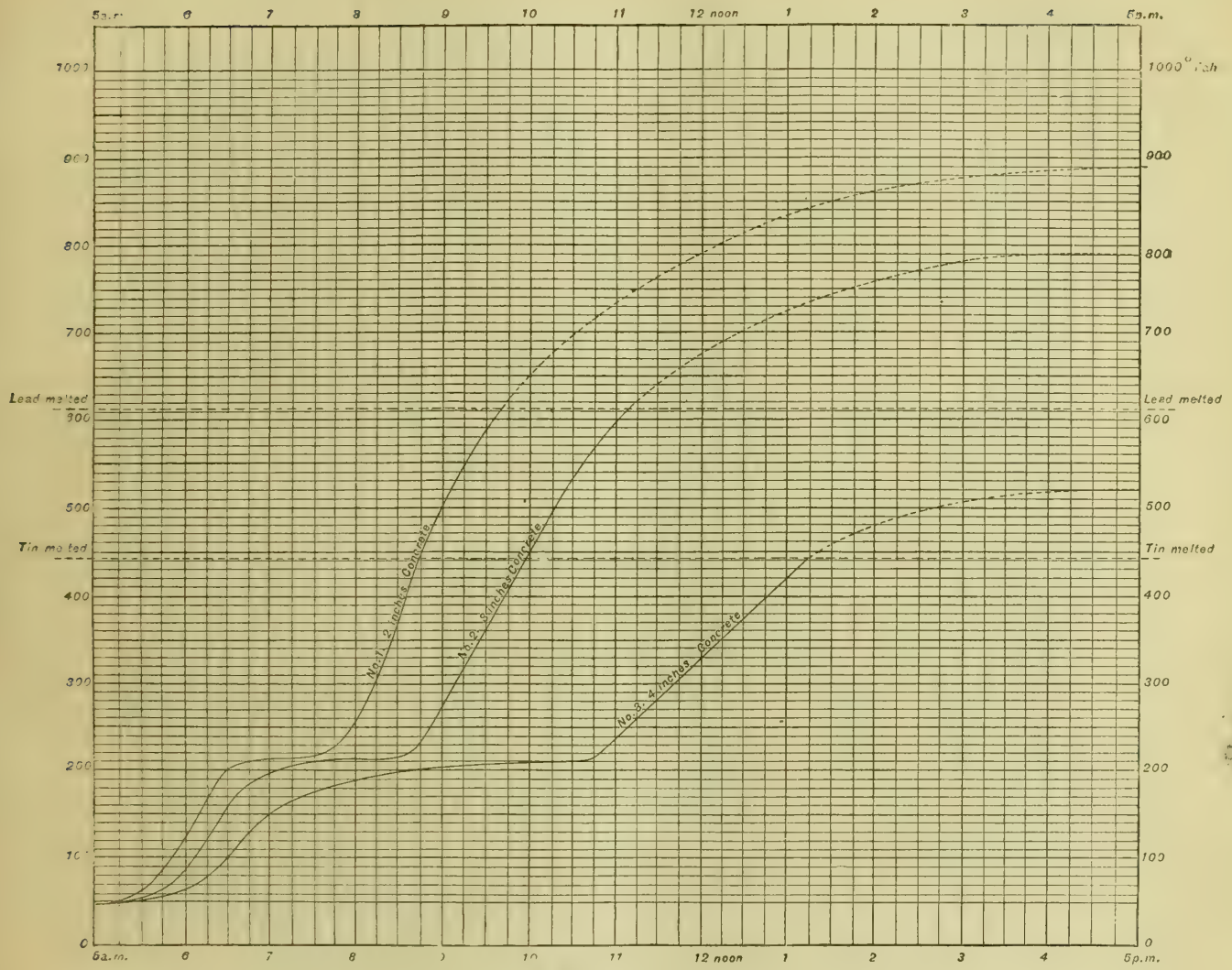


Diagram K.

of concrete of three different thicknesses, a flat bar of iron being let into each step with the effect of leaving 2, 3, and 4 inches respectively under the bars; two small squares of metal, lead and tin, were let into each bar, and needles made to rest thereon, so that on the melting of the metal the needles should sink.

From the observations taken, the Thermal Chart L was constructed, showing that in three hours after the fire was lighted the iron protected by 2 in. of concrete was at 250 deg., in 5 hours it was 650 deg., at end of 12 hours 900 deg., or red hot in the dark; while the iron protected by 4 in. of concrete did not in $5\frac{1}{2}$ hours exceed 212 deg., in $8\frac{1}{2}$ hours 450 deg., and at the end of 12 hours 550 deg., or less than the melting point of lead.

A more complete test of the action of fire and water on an actual floor section was made on a slab 6 ft. long, 2 ft. wide, and $7\frac{1}{2}$ in. thick, supported at the extreme ends only. The tie metal in gridiron form was placed at the middle of the thickness, 3 in. of concrete being above and 3 in. below; a load of 300 lbs. to the foot over the whole surface was obtained by bricks piled up, the deflection under this load for a span of 5 ft. being 1-32 of an inch; the fuel was arranged to form an



Thermal Chart L.*

incandescent bed 6 in. thick, at 12 inches below the under face of the concrete slab. The fire being kindled at six o'clock in the morning had by eleven become an intense heat perfectly uniform over the entire surface, and the bottom of the concrete was also at a glowing red heat all over; at this intensity the fire was kept up till 4 p.m., when the slab deflected 3-8ths of an inch. A stream of cold water was now thrown forcibly against the bottom of the slab for some twenty minutes and the load was then removed: the under side of the slab was uninjured, and the next morning the slab being entirely cold the deflection had disappeared. A second trial was made; during the firing the slab deflected as before, but the load was left upon the slab, which upon cooling returned to its original level lifting the load with it.

This brief summary of Mr. Hyatt's Treatise is sufficient to show its value and importance, and

* This diagram shows the heat imparted to iron bars when protected by 2, 3, and 4 inches of concrete, placed in the arch of a furnace and heated for 12 hours, the underside of concrete being red hot in 2½ hours after fire lighted.

to suggest the expectation that experiments so well conducted will be renewed and further important results obtained.

There is one material to which I have not yet alluded, and whose merits as available for fire resistance have not received universal recognition—it is wood. For although in large fires timber posts and girders have sustained comparatively little injury, iron columns and girders, thought to be "fireproof," have been utterly destroyed. Any form of construction in which the angles and edges of the wood were protected from fire action was not devised till Mr. Hyatt's patents of 1871 and 1873; he adopting the principle that to use timber in a way to have it fireproof it is only necessary to have enough material, proposed to lay the timbers side by side, so as to expose to flame only the upper and under surface. In 1876 Messrs. Evans and Swain obtained Letters Patent "for the construction of floors and roofs of great strength and simplicity, and possessing perfect fireproof properties," they like Mr. Hyatt took advantage of the property which solid timber possesses of resisting the action of fire for a lengthened period—provided the fire attacks it only on the surface and does not play round it; they took ordinary wood joists of any uniform depth and any thickness, two or three inches preferred, placed them side by side close together, and brought them laterally into close contact by bolts or spikes. As a protection to the under side they drove in flat headed nails and rended it with a thick coat of plaster. Solid staircases can also be built up in a similar manner. This form of construction has been subjected to the usual course of successful experiments and appears to possess much merit; it has been used by Mr. Ewan Christian in a public office, and is now being adopted in an extensive range of new warehouses, in course of erection at the East India Docks, under the direction of Mr. Manning, and with the sanction of the Wharves and Warehouse Committee. In place of the system originally required by that Committee, viz. wrought-iron girders and concrete or brick arches, supported by cast-iron columns covered with 4 inches of terra cotta, this system is being adopted—timber storey posts being also used. A saving in cost of construction amounting to about £9000 has been thus effected.

There are other systems for combinations of timber and terra-cotta—fire-clay and concrete casings to protect the timber—such as those of Mr. Thwaite, Mr. Moore and Mr. Butler, but I leave their consideration to the Discussion.

These brief and somewhat discursive notes will suffice to show that within the last few years the true principles which should govern the efforts to produce really fire-resisting construction, have been receiving some appreciation, and that very considerable advance has been made towards the realization of the possibility of producing a building worthy of being designated as fireproof. The Discussion which will follow will no doubt add much to the information we now possess, and consideration of the subject this evening give a wide extension to the knowledge of those principles by which every attempt in this direction must be guided.

The CHAIRMAN said they would now be glad to hear those gentlemen who had anything to say on the subject; he thought it would be well if the meeting would follow Mr. Cates's suggestion and would confine their remarks, in the first place, to fireproof construction, leaving their observations on concrete proper to the afterpart of the Discussion. The time had gone by when it was necessary to inquire whether concrete was a good building material or not; concrete when it *was* good, was very good.

Mr. MATTHEW ALLEN, Visitor, said he was a practical builder, and his attention was first drawn to the question of concrete in connection with the erection of dwellings for the working classes. He found that by burning clay or refuse from gas works, and mixing the burnt material with Portland cement, he obtained a fireproof material which possessed the additional important merit of great

strength. Such was its fire-resisting capability, that he was now using it for furnaces as if it were fireclay. He had carried out his principle of construction in new buildings for the Industrial Dwellings Company, over which Sir Sydney Waterlow presided. In those buildings the lintels, steps, copings, keystones, and, in fact, everywhere where stone would otherwise have been used, his artificial stone or concrete was used, made in moulds to the required shape and size. He had since carried out a block of buildings,—middle-class dwellings,—in Manor Road, Stoke Newington. Here the staircases and ceilings were entirely of his fireproof material, and, in fact, there was not a bit of wood in the whole construction. Until people got to know that it was just as easy to build both for stability and immunity from risk by fire, there would not be much improvement. A brick would exist for generations,—for ages, indeed,—uninjured; it was not possible to calculate its duration. Wood, on the other hand, was, if not burnt up, rotted to pieces in a very few years. As regarded fireproof bressummers, he thought the principle Mr. Hyatt had acted upon was the correct one; but he used about five times too much iron, and had not got enough concrete over the top of the iron. With all the lintels he (Mr. Allen) had used,—with a small piece of iron running through each,—he had never once had a failure. He treated iron in a building just as the bones were treated in the animal economy, *i.e.*, clothed it. As the bones gave strength to the human frame, so the iron gave strength to the various parts of a building; but just as it was needful to cover bones with flesh, so was it necessary to cover iron in a building with some incombustible material. Looking down on London from the dome of St. Paul's on the previous day, it was apparent at a glance that the city was being rebuilt,—had, indeed, been half rebuilt already. But how? As if it were built expressly to burn. Costly stone fronts many of these new buildings had, but they only concealed from the outside the 9 in. by 3 in. joists which supported the floors, and which, once a fire took place, would feed the flames. Then, again, there were staircases which seemed expressly intended to spread a fire when once it broke out. In ordinary houses, why should quarter-partitions be tolerated? Why not have $4\frac{1}{2}$ in. brick walls? The new Building Act was going to make staircases still more perfect as agents for spreading fire, by compelling an opening to be made at the top,—by taking out the "damper," in fact. Of all subjects that could be discussed by that Conference, he thought fireproof building was first in importance. He (Mr. Allen) claimed that the concrete which he used was equally as good as fireclay for heat-resisting purposes, and it was certainly much cheaper. Mr. Lascelles, the well-known builder, of Bunhill Row, had used, and was using, the material very extensively for a great variety of purposes, constructive and ornamental. It could be used for mullions, sashes, and doors, and it was possible to do without woodwork altogether.

Mr. CHARLES FOWLER, Fellow, said that architects had been unable to adopt fire-resisting construction, because there had not been discovered, or there was not generally known, any material which, used with iron, would answer the purpose of protecting the iron. Our neighbours across the water in France had got such a material in abundance, and they largely availed themselves of it in floors and partitions. That material was the coarse plaster of Paris, which resisted fire admirably; and the iron floors of Parisian houses, which had now been used for a generation, were based entirely upon the principle of bedding the iron in plaster. It was found that floors constructed on that principle were very strong and very light, and, incidentally, such floors had been found to be fireproof. In this country it was only recently that we had discovered a material which would answer the purpose of making iron structures fire-resisting. Mr. Matthew Allen appeared to be one of the first to adopt such a material. Others had followed in the same direction. There was one difficulty which arose from the use of fireproof construction throughout a building, and that was resonance. But although it seemed to be impossible to get fireproof buildings, carved, as they might be said to be, out of one solid block of material, without resonance, fortunately a new material, "slag

wool," had cropped up. This material was obtained by driving a jet of steam into the waste slag as it came from the smelting-furnace, the result being a kind of incombustible cotton, tangled about and capable of being turned and twisted anyhow. It possesssed the great advantages of being non-resonant and indestructible by fire. Such a material would be of incalculable value for putting behind partitions and between floors in order to deaden resonance. It was a question with many who had considered the subject how far cement concrete and ironwork could be trusted to adhere perfectly and work well together. Although, in case of fire, the concrete would no doubt protect the ironwork, yet the heat must penetrate the concrete and expand the iron, perhaps to an extent sufficient to disintegrate the concrete. For instance, would Messrs. Waterlow's building in Finsbury, referred to in Mr. Cates's Notes, be equally successful in standing a second ordeal by fire? Until these questions had been answered by practical experience it was difficult to feel perfect confidence in systems of construction which combined the use of two such diverse materials as iron and concrete.

Mr. ALEXANDER PAYNE, Associate, said that in reply to Mr. Fowler's remarks he might mention a case in which concrete had been used in connection with iron and exposed to a great heat. About three years ago he had to carry out a manufactory at Oldham, in Lancashire, in which there were several large drying-floors. The flues from these were brought from one end of the building and there collected into a chamber lined with fire-brick from which one large main flue passed to the chimney. This chamber was covered with a dome of Portland cement concrete, with wrought-iron ring ties bedded into it to prevent the thrust. This was an instance of Portland cement concrete exposed to great heat and with iron embedded in it. With a view to this Meeting he had written to the secretary of the company for whom the manufactory was built to ask if the concrete cover or dome had ever cracked or shown any weakness from the effects of the heat, and he sent the following reply from the manager at the works:—

> "The underground flues are level until they meet the main flue just outside the end wall. At this junction they are covered by a concrete dome with stone slab 3 in. thick on the top. Although the heat at this point must have been immense at times, I never saw any signs of the concrete cover cracking."

Mr. WILLIAM H. WHITE, Secretary, wished to be allowed to add something to what Mr. Fowler had said as to fire-resisting construction in Paris. When, in 1840, iron joists began to be generally used in Paris, owing to the strike of carpenters, the system of construction adopted was not new in itself, for just as those iron joists were first embedded in plaster, so wooden joists had been, for at least a century and a half, surrounded with plaster. All the wooden floors made in the time of Louis XIV. were constructed in that manner. Indeed, the very complaint just made by Mr. Matthew Allen about our miserable and dangerous 9 in. by 3 in. wood joists was identically the same as that made by Evelyn in his Diary 200 years ago, when he compared the rough, inflammable wooden floors of London with the horizontal solid partitions and careful parquetry of Parisian houses.

Mr. J. DOUGLASS MATHEWS, Fellow, said that the observations already made tended to show that however perfect as fire-resisting structures some of the floors referred to might be, their cost would preclude their use. That was especially the case with the methods put forward by Mr. Hornblower and one or two others. It seemed to him that, until the question of cost could be solved, we should have to continue using "9 in. by 3 in. joists." Could that question of cost be solved? It certainly appeared to him that Mr. Allen had solved it in a very satisfactory manner, inasmuch as he was able to produce a fireproof floor and ceiling at a very moderate cost. It was beginning to be generally recognised that the smaller the quantity of iron used in fire-resisting floors the better. Now, instead of iron being, as formerly, the chief material, concrete was paramount. He thought that the experiments which had been made by Mr. Hyatt would give architects very great confidence in concrete. Mr. Brannon used so very little iron,—it could hardly be called more than wire,—

in his floors, that one almost feared to adopt them. He (the speaker) had made use of some of Mr. Brannon's iron doors, and remarkably light and satisfactory they had proved to be. One of the systems not mentioned in the Paper was that introduced by Mr. Moreland, which, as at first carried out, consisted of light lattice girders with corrugated iron laid across them, and covered with concrete. Mr. Moreland ultimately came to the conclusion that the corrugated iron was of little or no value except as a centering, and it was discarded.

Mr. JOSEPH JENNINGS, Fellow, observed, with reference to the losses entailed by the destruction of houses by fire, that the interest on the money expended in rendering buildings fireproof would be much greater in amount than the sums paid for insurance. Therefore, as a matter of pounds, shillings, and pence, although it might be said that a great deal of money was lost, it was not wholly lost, or the insurance offices would cease to be remunerative concerns. He thought that the whole subject of fire-resisting constructions was one which architects would do well to take up and study, for to most of them opportunities would often occur of carrying out such systems where the cost was not too great. One important point connected with the subject was that buildings supposed to be "fireproof" were often made to carry such great weights on their floors that they fell in almost directly the heat affected the iron supports. The law ought to insist upon such structures being made stronger, or else they should be less heavily weighted. There was a strong feeling at the present time that stone staircases would not withstand fire, but he never knew a case in which a stone staircase had not lasted long enough for all who were in the house to pass down it.

Mr. SWAIN, Visitor, said that he believed his firm (Evans and Swain) were the only patentees in England who had devised a fire-proof wood staircase, with the soffits and risers protected by plastering, the treads being removable. Although, as the last speaker had said, it was possible that a stone staircase would last sufficiently long to enable those in a burning house to escape, the safety of the firemen and salvage corps men should by no means be forgotten, for they had important duties to perform in rescuing property. Unless staircases could be made of a really fireproof material, the firemen would not venture on them.

Mr. DRAKE, Visitor, said that he had had twelve years' experience in the erection of concrete and fire-resisting structures, and ten years ago he had perceived the non-necessity for heavy iron girders. He had used light bowstring girders, and had constructed a number of very light but remarkably strong floors in various parts of the country. He had also constructed several concrete staircases, with iron imbedded in them. The steps of one of these, erected in 1871 at his own house, had a bearing of 2 in. into the wall, and every step had stood the test of being weighted with 15 cwt. After all that had been done in the use of concrete and iron, it was still a mooted point what amount of iron ought to be used,—where, in fact, it was necessary to begin to supplement concrete with iron. He thought Mr. Hyatt was deserving of great thanks for the experiments he had carried out and published for the benefit of everybody.

Mr. HOMAN, Visitor, remarked that it was a mere matter of calculation as to the amount of iron required. Mr. Allen's remarks had been very practical and very sound. Iron should always be covered by the concrete, because when so covered it was practically indestructible by fire. As to insurance, he was sorry to say that insurance offices, as a rule, did not favour fireproof construction. When he (the speaker) first introduced his system, he brought it before the notice of two fire offices, the Sun and the Alliance, and they agreed that where his system of construction was adopted they would charge the minimum rate of premium. He asked them to charge only something like the Paris rate of premium on such buildings, viz., from 4d. to 7d. per £100 insured, but they refused, with an implied intimation that they did not intend to commit the "happy despatch." His firm (Homan and Rodgers) last year finished the How Bridge Mill, in Lancashire, and the owners, owing

to the fire-resisting construction, saved in insurance premiums to the extent of £600 a year. Othe mills similarly constructed were saving on fire premiums to the extent of from £400 to £900 a year.

Mr. BUTLER, Visitor, explained his system of rendering fireproof the ordinary wooden floors supported on timber joists. By means of terra-cotta or fire-clay tiles or slabs, and concrete and plaster, he was able to render such floors fireproof, at a cost of about £2 10s. per square of 100 feet. Some experiments had been tried that afternoon, in the presence of Mr. Vulliamy (the Superintending Architect to the Metropolitan Board of Works) and a number of district surveyors, on a specimen floor constructed on that principle in Victoria Street, and with the most perfect success—a fire having been burning under it for two hours without having the slightest detrimental effect on it.

Mr. A. D. DAWNAY, Visitor, remarked that the construction of a flooring which should meet the requirements of either dwelling-house or manufactory, composed of incombustible materials at a cost likely to induce an almost universal use, engaged his attention some ten years ago, at about the time when rolled iron joists were first imported into this country from Belgium; in conjunction with others, a system was perfected which, though not absolutely unknown in some of its details, was wholly new in others. He referred to that of rolled iron joists and concrete of various compositions. The cost per square nine or ten years ago for iron or concrete was from £5 to £8 when joists only were used, and in the case of large spans needing a sub-division by girders, the cost was as much as £10. The expensiveness of the system proved a considerable drawback, and many expedients were resorted to to lessen the cost. As opportunity served, he conducted experiments upon various spans, and came to the conclusion from the results that owing to the immense strength of well-made concrete, a saving might be effected by placing the joists closer together and giving up the ⊥-bars entirely. There was some difficulty in this at first, for want of a better form and section of joists. Circumstances, however, were propitious, and new sections were forthcoming. He ultimately adopted a plan of placing iron joist-binders at from 7 ft. to 10 ft. apart, and filling in between with light joists 15 in. to 18 in. apart. By this method the concrete wholly embedded the small joists, and became transversely joggled into the binders. Of course, the ultimate well-being of such work lay in the concrete. If it were done slovenly, or composed of indifferent materials, the result was one of imminent danger.

Mr. W. H. LASCELLES, Visitor, explained a number of his many and varied applications of concrete to building purposes. He added that not only doors, but window-sashes, were being constructed of concrete, with a very small quantity of iron embedded. The concrete used in all his productions was the same as that introduced by Mr. Matthew Allen.

The CHAIRMAN, after a brief reference to the mention made by Mr. Cates of his "Essay on Concrete," to which the first Medal of the Institute was awarded in years gone by, said that time would not allow of the further discussion of the subject, or of special reference to concrete proper, as to which much more might be said hereafter, particularly as to the possibilities of treating concrete artistically, with great usefulness. There were one or two disjointed matters as to which he wished to say a word. Reference had been made to the matter of cost, and some gentlemen had at once put aside the question of the desirability or the practicability of attempting to erect fireproof constructions, on account of increased cost; but cheapness of first cost ought not to be aimed at to the exclusion of all other considerations. It should be one of the duties of architects to endeavour to persuade the people that to build well was to build cheaply. On the Continent, they did not sacrifice everything to cost,—although it was true that abroad they did not labour under the incubus of our system of short leases. Only that morning he had received a letter from Dr. Schliemann describing a house he was building for himself in Athens. In that house the floors were formed of fireproof arches covered with a concrete mosaic floor, and there was no wood whatever in the house except the doors. If that could be done in Athens, why should not we do it in London?

One inference to be drawn from the Discussion was that a great deal too much iron was used in some fireproof floors as hitherto constructed, and no doubt in many cases less iron would suffice, provided that the concrete was good; for in using concrete it should always be borne in mind that unless it were thoroughly well done, with good materials and by men who could be trusted, it was a deception and a snare. For instance, though he did not wish to throw cold water on Mr. Brannon's process, to which allusion had been made, he had vividly in mind an instance where somebody who did not perhaps understand Mr. Brannon's mode of construction had formed a large roof over a shop, which ultimately fell, the materials never having properly aggregated, and killed a man who was below. Now, he did not mean to say that there was the least error, either in the theory or in the prescription, but what he did insist upon was that unless concrete work was well done, it was worth nothing. To show how slowly things were taken up and pursued in England, he was reminded by what had been said in the Discussion as to the use of plaster of Paris, that twenty years ago Mr. William Hosking, who did many original things, formed a floor in one of Clowes's printing-houses precisely in the manner referred to, embedding the whole of the woodwork in plaster of Paris. He believed that the floor stood to this day, and had succeeded admirably; but it was curious to find that, when such a thing had been attempted, and found to succeed, and was spoken well of, yet nevertheless, it was allowed to die out. He trusted that what had been said then, and what might be printed in the "Transactions" of the Institute and in the professional journals, would lead to a thorough review of the whole question, and to an endeavour to lead to an authoritative decision as to the best methods of fireproof construction. Architects would pass through an exhibition of building appliances and materials, but few of them thought of using any of the appliances or materials they saw there. Of course, as he well knew, difficulties arose to prevent the introduction of novelties, either with the client as to their cost, or from the architect's disinclination to incur responsibility for their possible failure. Mr. Jennings had remarked, upon the subject of cost, that it was practically more advantageous to build houses that would burn rapidly than houses that were fireproof, because, by means of insurance, the owners of the property were compensated for loss by fire; but such an argument hardly needed to be refuted. Were such a system to be generally pursued in other matters, the nation would soon be reduced to poverty. The question of fireproof staircases was a very important one, and had received an interesting illustration in the case of the concrete stairs described by Mr. Drake as having sustained a load of 15 cwt. on each step, one end only being inserted into the wall. With a fireproof staircase there could be no possible objection to having an opening at the top, as objected to by Mr. Allen, and, indeed, it was in most cases necessary for ventilation and health. Want of time precluded him from making further remarks, as one point would lead to another. In bringing the Discussion to a close he would wish to thank the several gentlemen who had attended to afford information as to their own patents and contrivances,—information that had been given in the most reticent and admirable manner, without any display of self-seeking or the urging of personal claims.

APPENDIX.

(1.) BOURNEMOUTH, 28th May, 1878.

SIR,—In reply to your favour I will jot down a few remarks upon the subject of Concrete as a fire-resisting material.

Plate concrete floors without any iron: for large spans, 1 Portland cement, 1 sand, and 3 broken pottery tamped; for smaller spans, 1 Portland cement, 1-5 sand, and 4 broken pottery tamped.

Formulæ for strength: $\frac{16\ K\ B\ D^2}{L}$ for W, and $\frac{L\ W}{16\ B\ D^2}$ for co-efficient of rupture, for a plate firmly fixed into two opposite walls; and $\frac{40\ K\ B\ D^2}{L}$ for W, and $\frac{L\ W}{40\ B\ D^2}$ for co-efficient of rupture, for a square plate firmly fixed into four walls.

The formula for an oblong plate firmly fixed into four walls hovers between these two formulæ.

The value of K entirely depends upon the goodness of the concrete, but may be taken as between 1 cwt. and 2 cwt. In the calculation the weight of the plate is deducted and the plate is made eight times stronger than any weight or force likely to be brought upon it.

The walls require to be strong to bear the leverage of the plate floor, and care has to be taken to avoid piers or pillars immediately upon the plate; these piers or pillars should be surmounted with arches so as to carry a wall upon which the plate may be attached.

When the centering is cased under the plate floor a small permanent set will probably ensue, unless the plate is fully hardened. The elasticity of the plate should be determined by placing a load in the centre, measuring the deflection, removing the load, and noticing if the plate fully recovers its position.

As regards resisting fire, by calculation each room could be so arranged, that in the event of the stores being all on fire in the room, the heat developed would not be sufficient to raise the temperature of the concrete envelope beyond 700 deg. Fahr. Each room to be fitted with a concrete door made of tamped concrete of one cement to two parts slag or ground pottery. Staircases to be similarly constructed with steps of tamped concrete—silicated if desired. Although there are many materials which resist fire a great deal better than concrete, the cheapness of this material, the facility of adding thickness where required, either in walls or plate floors—the great strength of a plate floor when it is square or circular in form, and when the edge is like a casting and forms part of the sustaining wall, seems to point to this material, and the plate floor system of using it, as eminently adapted for fireproof structures.

Yours truly,

ARCHD. C. PONTON.

ARTHUR CATES, ESQ.

(2.)

ESTATE OFFICE, ARDFERT, IRELAND, *June* 5, 1878.

SIR,—I have built labourers' cottages, farm houses, and farm buildings of all kinds of this material and always with success, having throughout a period of some six years never had a single accident or failure in the construction of walls. I have used concrete for the ground floors, also for window sills, barge courses, water tanks, gate piers, steps, road and yard surfaces, troughs, partitions in cow houses between the stalls and door blocks, in all these with similar invariable success, also for several bridges built throughout of the same. But the use of concrete, to which I desire your attention, is for roofing, instead of timber and slates. Our first attempt was for a dairy; but the impatient farmer removed the centres after ten days and narrowly escaped the fate of the roof. We set to work at once to put it up again, and the result was a perfect success. It makes a roof so cool that the dairy women find the milk can be kept harmless twelve hours longer than even under thatch. There is a 6 in. covering of earth and sods on top, growing a garden of daisies. Our next attempt was more ambitious. We covered a cow byre, 65 ft. by 52 ft., with three arches of concrete resting on two lines of metal columns, which were connected by a beam or bressummer of concrete upon which the roof arches rested. The walls were tied by thorough 1 in. round iron bars and metal wall plates. The day the centres were removed a body of eleven men marched over the three arches in line, and thus gave the farmer confidence to trust his cattle beneath the structure.

I am now preparing to roof a hay barn, 70 ft. by 88 ft., with three lines of concrete octagonal columns 15 ft. high, connected as the iron ones in the former instance and supporting four arches of 16 ft. 6 in. span. The section of our roofs shows 7 in. thickness at the springing and 3½ at the crown. The rise is 1 in. to every foot of span. The proportions of cement and gravel are as 1 to 5. The time given before striking the centres is 6 weeks. The finishing coat is cement and sand in equal parts, covered with tar.

We have had some trouble staunching the roofs, but have been successful in the manner I describe, though wishing to get rid of the tar if we can eventually. One roof failed lately; it was a small one of 16 ft. span, but when the pickaxe was used to raise it, the concrete was found quite soft in the centre of the lumps though hard on the surface. We trace this failure to bad cement. If any convenient and cheap means of testing cement by the small employer of it, could be discovered it would be a great boon.

Roofing with concrete saves from 66 to 75 per cent. when compared with red pine roofing and Bangor slating. This makes it possible to build labourers' cottages at such a price as will enable the Irish peasant to pay with ease a fair interest upon the outlay; so that with this system a great improvement ought soon to be found in the state of the dwellings of the poor.

Our proportions for walls are 7 gravel to 1 cement. For tanks the same. Our walls vary from 4 in. to 15 in. thick. Our joists rest upon an offset made by reducing the wall from 12 in. in the lower storey to 9 in. on the upper—a principle applicable to any number of floors. Our gravel is from the sea shore, perfectly clean, but not very sharp, nor quite free from sand. Our builders are a motley company of farm labourers, whose foreman was a horse trainer, and their clerk of works an intelligent plasterer. Our framework is not a patent system, but plain wood panels rising

between 20 feet battens fixed in the earth and ledged together at the top. We save 4s. a cubic yard when compared with rubble masonry, though we live in a limestone country where stone and lime are abundant.

I am, Sir, your obedient servant,

ARTHUR CATES, Esq. GEORGE F. TRENCH.

(3.)

Experiments made on concrete with Gibbs's slow setting cement:—I lay stress on *slow* because that means cement with a minimum of chalk, an important matter in a fireproof concrete. The experiments were made expressly for me, the slabs were also made from my specification.

No. 1 slab.—1 part cement, 2 sand, 4 ballast.

No. 2 slab.—1 part cement, 3 broken and crushed pottery, and 3 burnt ballast } made up with water.

No. 3 slab.—1 part cement, 3 coke breeze, 3 crushed and broken slag, 3 crushed crockery; made up with Silicate of Soda.

After being made up for six weeks they were subjected to fire tests on the 7th and 8th of August, 1877, with the following results :—

7th August.—The fire was composed of coals, coke, staves of grease casks, and firewood was lighted at 4 p.m. At 4.30 the slabs were cool on upper surfaces, at 5 there was a slight heat; cold water was then thrown on, at 5.15, without producing any effect. Kept up fire both sides of slabs, added some petroleum, and at 6 o'clock poured on two pails of cold water without producing any flaws.

8th August.—Fire lighted at 6 a.m., fuel same as on previous day; when fire was at full height, at 1.30 p.m., threw six pails of cold water on slabs and let fire out. Upon examination of Nos. 1 and 3 they were found cracked, and crumbled away on the edges upon being rubbed with the hand. No. 2 showed a small flaw at corner of slab.

8th October.—Again examined. Slabs Nos. 1 and 3 had hardened up; No. 2 appeared about the same.

Size of each slab 2 ft. 8 in. by 2 ft. by 8 in. In each slab was embedded a small iron frame sunk about 2 in. from surface.

T. E. KNIGHTLEY.

(4.)

NOTES OF PERSONAL EXPERIENCE OF CONCRETE AND FIREPROOF CONSTRUCTION.

By J. N. PEDDER.

CONCRETE.—*Ballasting or Body-stuff—Burnt Clay.*—I have found it advisable for securing the union of the cement with the burnt clay, that it should not in burning pass into vitrification, for this reason burnt ballast and strong country bricks for coarse work are preferable to very hard vitrified stocks, and pottery and pottery biscuit are better than vitrified china and glazed ware. For walls and all other constructions of a massive kind receiving vertical pressure only, or the thrust of superincumbent work, any flint, limestone, or other stone ballasting and silicious sand are equal if not superior to burnt clay, but to produce a strong work an equal mixture of burnt clay and silicious ballast is best, except where fire is not likely to act when a hard limestone cemented with lime burnt from the same stone is very good. *Burnt clay ballast, broken bricks and bats, clinkers*, in which the carbonaceous matter is thoroughly burnt, and combined with a percentage of metal, crushed coarse for all special fireproofing work as ballast for walls, roofs, and floor bodies, but ground to any requisite degree of fineness for surface work, such as for wall, floor and ceiling facings, doors, &c. *Sea shingle and sand* (silicious) being *salt*, for outside sea walls and other strong heavy work. *River warp and sand* (silicious) for indoor work. *Mixed ballast* of all kinds of earth, clay, clayey gravel, loam, sandy loam, rubbish of spoil-banks, waste and dust heaps, properly burnt in heaps so as to convert all ligneous and decomposable matter into hard carbonaceous substances, and to dissipate water and elements unfriendly to setting of cement compounds.

Cementings.—Cements aluminous and ferruginous. *Hydraulic* (quick-setting) for strong external work, floors, roofs and other constructions liable to exposure to the weather, the action of water, great superficial wear from friction, treading, &c., and for all external doors, or doors for cottages, factories and the like. *Portland* can be used alone with any ballasting, but if gauged with lime or mortar the latter must have been mixed for a long time, kept wet, turned and well tempered. In such cases also, only chalk limes or pure limestone limes can be used. No sulphatic or magnesian lime can be mixed with Portland. *Roman* and *Medina Cements* are inferior to Portland, but suitable where very quick setting is required. *Selenitic* lime, or any poor or fatty quicklime mixed with a small percentage of sulphuric acid or sulphuratic lime (Paris Plaster), slow setting, suitable for walls and floors. *Magnesian limes*, pure or carbonate limes (chalkstone limes, &c.), suitable for strong wall and heavy work only.

In one instance I constructed a block of buildings, containing twenty-four rooms, entirely of refuse from some spelter works, such as old retorts, &c. ground up, gauged three parts to two of sand and one of Portland cement for walls, the whole thoroughly mixed in a dry state, and turned over at least four times with the shovels after the addition of the water, and bonded with flatners of burrs, slag, &c. The floors and roofs were gauged as follows :—For the soffits (forming the ceilings of the rooms beneath) equal parts of ground ballast and cement, and for the body of the floors five parts rough burnt ballast, such as out-throw from the sieves; one part of sand and three of

cement, and on this a layer of small pieces of slag, stone spalls or chips, well trodden in and grouted with one and one, the whole *finished* with one fine ballast, one sand, and two of cement, and in the case of a reservoir, measuring 160 ft. by 60 ft. by 11 ft., constructed on the slope of a hill, I caused a portion of the excavated subsoil, which was the general boulder clay of the district, to be burnt into ballast; of this, when ground, and Portland cement, I constructed the walls and floor, and the reservoir has been in constant use since its completion, now about six years.

FIREPROOF CONSTRUCTION.—This is a subject which has engaged my attention for a number of years, and I have no hesitation, after considerable experience, in stating that the principles I have adopted, when properly carried out, are *absolutely fire-resisting*. It is now undoubtedly proved that under severe fire—as used in ordinary construction—all known natural stones utterly fail. Limestone, as at Chicago, granite, as at Berlin, and even concrete and cemented sandstone, as at the City Flour Mills, are incapable of standing an hour's fire. *Iron* invariably fails when presented in the most solid masses, no matter whether cast or wrought, and in any form, size or treatment when in the face, or external to the body, of any wall, or when used for doors or closets, or in any exposed position whatever; when so used it not only expands, contracts, coils, twists and pulls down buildings, but when external to and in contact with lime, cement, brick or stone, it causes them to yield by inducing a fluxing of the calcareous, silicious and aluminous matter, either prematurely, or in many cases when apart from the external iron they would not flux or vitrify at all. The system I have adopted is as follows:—For floors, bedding plates (pieces of metal scantling, such as angle iron, &c.) are laid on the walls, and to these the stanchion feet and heels of the joistings or angle iron girders, trussed with a lighter scantling of the same, or bracing trusses, or straining rods of the floor, are attached by bolts or other fastenings. Wire, about 2 in. apart, is then strained over the whole extent of the floor on its under side or soffit from plate to plate, and made fast also to the under or tie rod of every joisting, and wire in like manner strained upon the exterior side of the wall framing. Before laying in the concrete a centering or platform made of boards or metal plates is made under the floor, and a similar enclosure fixed round the outside to form the wall face. The soffit or lower part of the floor is formed by the first tension bed which is a layer of thoroughly mingled cement and fibre—such as cocoa-nut breakings—or strongly cemented and well wrought concrete of burnt ballast and fibre spread over the whole area enclosed by the wall boards or clamps, embedding the soffit and facing wire work, and very firmly compacted about it by treading or other pressure. Next upon this is formed a tension seam of any long fibre, such as hemp, laid in liquid mortar or cement. Other tension beds and seams are laid alternately to the depth of about one-third or one-half the thickness of the proposed solid floor, the upper part thereof being formed of any coarse or hard concrete, tiles, bricks, slates or stones, laid in suitable cement and forced together very solidly, the floor being finally finished as already described. Roofs I have constructed in a similar manner, and being flat (protected by a parapet) not only recover the building area, but in the case of artisans' or tenemented dwellings, are serviceable as playing or drying grounds or gardens, and for either purpose affording purer air and a greater amount of sun warmth and light than could be obtained on the ground level. The walls I face internally and externally by using draw boards next the inside of the clamping, which are removed when the hearting of the walls is partially set, and run in a strong concrete of sifted burnt ballast and cement; then by ramming the flatners of slag, &c., it forces the whole to the clamp boards, and leaves the work clean and finished on their removal, obviating the necessity of plastering. Buildings so constructed I have subjected to the fiercest heat for many hours, the fire being composed of coke, coal, timber, pitch, paraffin, &c., and the fire cut off from the other parts of the buildings by doors constructed on the same principle with panels only three-eighths of an inch thick. In this manner fire can be isolated and restricted to that part in which it may originate.

The way in which these results are accomplished seems to be dependent on the following principles:—That the small quantity of iron used is placed so that direct action of fire upon it is impossible. It is so protected that the most intense external heat only seems to give to it the greater toughness of low heat. Being covered up from the combustive action of fire and the consequent changes, oxidation can only be set up to a limited extent, probably to the extent of liberation of oxygen from the lime silica, alumen and woody fibre, and to that extent being imbedded in the mineral mass it can only add strength to the mass by converting it into ferruginous stone of a greater strength. The supposed drawback of expansion and contraction of iron used in these small quantities, and the fibrous interwoven form, will be no difficulty but an advantage, as the contraction of alumina and expansion of iron are compensated, and the re-contraction of iron in cooling will add greater strength to the mass. The fibre being in like manner imbedded in and protected by the cemented mass is also preserved from any destructive combustion, and the degree in which long continued and intense heat may at last carbonize it will react in its continued preservation and strength, by re-carbonizing the lime and re-oxidating that with the silica and alumina to the extent to the action of fire in them. In one word, the complete embedment and compression in, and the combination with, the cemented or concreted mass of the metallic or vegetable or woody fibre—*all in an extremely divided state*—and so as to be hermetically sealed against the escape of any of their inherent elements or the admission of any foreign ones, thereby preventing destructive combustion or any tension, appear to be the rationale of the extraordinary powers of this system, and every successive test has as yet only shewn its capabilities alike for strength and resistance to fire.

Royal Institute of British Architects.

GENERAL CONFERENCE, FRIDAY, JUNE 7TH, 1878.

Afternoon Meeting: EDWARD M. BARRY, R.A., Member of Council, in the Chair.

THE IRON RIBS: ROOF OF THE CORN EXCHANGE, MARK LANE.

By EDWARD I'ANSON, F.G.S., Member of Council.

THE Old Corn Exchange in Mark Lane, London, having fallen into decay, and the market, which had already been considerably increased by an addition to the area of the original market space, being still insufficient, an adjoining piece of land has been acquired and a new Exchange is now in course of erection on the enlarged site. The building will be about 100 feet in width, and after long deliberation it has been determined that it shall consist of a block about 40 feet in depth next Mark Lane, containing, on the ground floor, the staircase, vestibule, &c., and on the first floor a flour room; and in the rear of this block a central area or nave surrounded on three sides by aisles. The nave will be 60 feet in width and the aisles each 20 feet. The nave is separated from the aisles by an arcade, the arches of which have a span of 20 feet, and the height to the top of the cornice over the arches is 30 feet measured from the floor. The roof over both aisles and nave is carried by curved ribs of wrought iron, each of which springs from the floor; has a span of 100 feet, and rises to a height of 61 feet 9 inches from the floor, and is seated over one of the columns of the arcade. That part of the rib which spans the nave is semi-circular. At the floor level each rib is bolted down to the brick pier built to receive it, and secured to one of the iron girders which, running across the Exchange from side to side to carry the floor, acts also as a continuous tie applied at the springing or lowest part of the rib. The iron ribs, like the columns of the arcade dividing nave and aisles, are 20 feet apart from centre to centre. As to the construction of the roof, which has been the result of most careful consideration, I do not here propose to make any remarks, my present object being only to describe the iron ribs which it has been decided to use in order to carry it.

The profile of the rib having been determined, the question was what section should be given to it, and under the advice of Mr. William Barlow, the well-known engineer, the following dimensions have been adopted:—The depth of semi-circular portion which spans the nave is at the apex 2 feet, and gradually increases until at the point where it springs from the top of the nave arcade it is 3 feet 10 inches in depth. The depth of that portion which spans the aisle is, for the vertical part 1 foot 9 inches, and for the curved part 2 feet. The rib is made up of top and bottom plates, web and angle irons. The dimensions of these parts are (with the exception of the web which, as before stated, varies in depth) uniform throughout, and are as follow:—

Top and bottom plates, 11 inches wide and 5-8ths of an inch thick.
Angle irons, 4½ inches by 4½ inches, and 5-8ths of an inch thick.
Web, 3-8ths of an inch thick.

The ribs have a tie at the feet as already described. It will be observed that the object to be attained was a rib which should bear upon the arcade but exercise no thrust upon it, and that the

the whole rib, securely fastened at the bottom, should be perfectly rigid throughout. In order to test the capabilities of the rib, a small tin model was made, and being heavily weighted shewed a tendency to rise from its seating on the arcade, demonstrating the necessity for giving considerable stiffness to that part of the ribs which would span the aisle. This model represented, correctly to scale, the span and height of the rib, and also its profile, but did not represent with anything like accuracy the sectional areas.

On Mr. Barlow's advice a model was made of two ribs one-fourth full size. These were constructed of wrought iron and built up with flanges, plates and angle irons all riveted together; they were accurate representatives in every detail of the proposed ribs. They were made by Messrs. Moreland, and carefully tested at their works in Old Street, St. Luke's, by Mr. Barlow.

To conduct the test they were placed on baulks of timber, at the proper distance apart, and tied at the feet by iron ties. They were connected by purlins of iron placed in the exact position the purlins will occupy in the work. There were six purlins in all, three on each side of the roof, and all placed at levels above the springing of the rib from the arcade, that is there were no purlins on that part of the rib which spans the aisle. As in the building the load will be received by the purlins, and by them transmitted to the rib; the test loads were suspended from the purlins also.

The following is a table of the loads successively applied, and the resulting deflections, the loads being in cwts. and the deflections in inches :—

Load on lower Purlin.	Deflexion.	Load on middle Purlin.	Deflexion.	Load on top Purlin.	Deflexion.
$6\frac{3}{4}$	·01	$6\frac{3}{4}$	·06	$6\frac{3}{4}$	·07
10	·01	10	·06	$7\frac{1}{2}$	·08
15	·03	15	·11	$11\frac{1}{4}$	·13
20	·05	20	·16	15	·19
25	·06	25	·19	$18\frac{3}{4}$	·24

Under the last load, viz. : 25 cwt. on lower purlin, 25 cwt. on middle purlin, and $18\frac{3}{4}$ cwt. on top purlin, the extrusion at the point where the rib springs from the nave arcade was $\frac{1}{4}$ of an inch on each side, that is $\frac{1}{2}$ an inch for the entire span from arcade to arcade.

The greatest load applied to the model was equivalent to about one and a-half times the calculated maximum of dead load which the rib will have to sustain in the building. When the weights were removed the model ribs resumed precisely their original form, no part having shewn signs of undue strain.

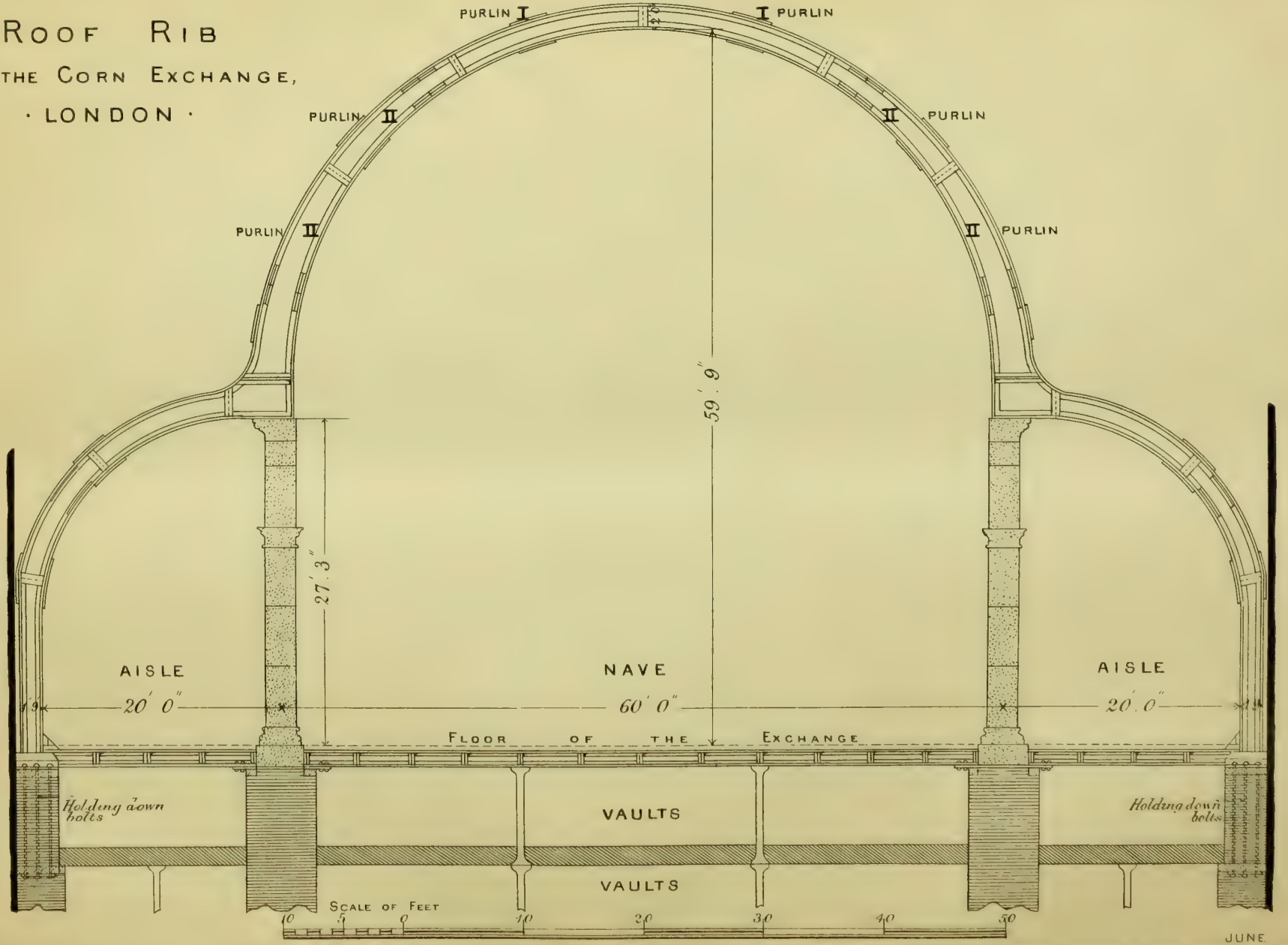
The experiment was considered satisfactory, and the ribs destined to carry the roof of the new building are now being constructed of the form shewn by the drawing.

Mr. W. H. Barlow, F.R.S., Visitor, opened the Discussion with remarks upon the peculiar construction of the roof, and of the necessity, as it had seemed to him, of making the experiments referred to by Mr. I'Anson.

Mr. T. H. Watson, Fellow, offered a few observations; and

The Chairman said that according to the Paper "the greatest load applied to the model was

ROOF RIB
FOR THE CORN EXCHANGE,
· LONDON ·



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Lithog^d for the R I B A by C.F Kell. London

equivalent to about three times the calculated maximum of dead load which the rib will have to sustain in the building." Perhaps Mr. Barlow would kindly explain that. He understood that the model in question was about one-fourth of the full size. Was the weight applied one-fourth of what might be supposed to come upon the full-sized structure when finished?

Mr. BARLOW.—No; one-sixteenth.

The CHAIRMAN said he should like to have the opinion of Mr. Barlow as to the value of models as tests of a structure. How far did the experience of engineers enable them to rely upon models as tests of strength? Were engineers generally satisfied as to the general accuracy of the data derived from testing models?

Mr. BARLOW said that models would give perfectly accurate results if tested under precisely similar conditions to those in which the finished structure would be placed; but it was not always easy, or even possible, to ensure such similarity of conditions. Now, as a general principle, of course the increase of sectional area would increase with the square of the span, the weight of the structure itself went on with the cube of the span, and the deflections went on as the span. Now it required that one's head should be clear upon these three points. In the case of Mr. I'Anson's roof, where the weight of the structure itself was not a material part of the weight it had to sustain, an increase in the weight of the structure did not materially affect the span. But in the case of a very large structure, such as the Menai Bridge, one was obliged to take into consideration the weight of the structure itself. The model of the Menai Bridge was not tested under the same conditions as those of the bridge itself. The model was made of 75 ft. clear span, and in order to minimise trouble and expense, it was tested with all the weight in the middle instead of being spread all over the structure. Although that was a very good test for the upper and lower members of the structure, it was not a good test for the sides, which in the structure of the tube itself were, owing to the misleading results of the test, made too thick. He said this with no disrespect to the memory of its designer, Robert Stephenson, than whom no man took more pains to make his work perfect. He possessed the best knowledge available at the time. But the fact was that when that structure was designed engineers did not know so much about the application of iron to engineering purposes as we in the present day did. One result of that improved knowledge is that open-work girders are found to be much more economical than tubular girders.

The CHAIRMAN congratulated the Meeting on the interesting information which had been elicited from Mr. Barlow, not only upon the subject of the particular roof in question, but upon other important matters. The roof was interesting to architects not only as exhibiting a somewhat novel application of iron on a large scale to an architectural work, but also as exemplifying the way in which the architect and engineer could work together hand-in-hand. That was a matter of very great importance. The architecture of the future could scarcely fail to be modified by the scientific knowledge we now possessed of iron and other materials. It might almost be said that iron had been "discovered" as a building material within the time of the present generation. The construction of the great engineering works which had marked the present age would not have been possible without that extended application of iron to constructional purposes which had been the peculiar work of the engineers of our time. Architects had, perhaps, been a little behind-hand in the use of iron, and had been somewhat prone to stand aside and criticise what their brothers the engineers were doing; but now that engineers had proved to the public at large the convenience of iron construction, architects were bound to avail themselves of the advantages offered by its use in their own designs. Wherever the architect and the engineer would unite their talents, the result was the more likely to be satisfactory. In the days of the Greeks, there were few constructional difficulties in the works they

undertook. Going back still further, we found the works of the Egyptians exceedingly massive, yet, apart from the mere question of removing enormous blocks of stone from place to place, there was not much to be learnt from them as to construction. With the Romans, the introduction of the arch led to the use of smaller stones, while enabling wider spaces to be spanned than would have been possible with a trabeated system; Roman architecture became in consequence more interesting from the constructional point of view. There was very little doubt that had the Romans known as much about iron as we did they would have adopted it in their buildings, and would have taught us something of value as to its application. Passing to Mediæval times, there was the same readiness to resort to ingenuity of construction as was manifested by the Romans. Although necessarily limited as to the width of his arches, the architect of the Middle Ages was continually anxious to enlarge them, and to add to their height. Such anxiety had often culminated,—at Beauvais, for example,—in disaster. It could not be doubted that the architects of the Mediæval period would have ceased to restrict themselves to their comparatively small spans and often timid construction had they been masters of such a material as iron. At the present day, he thought architects were a little too apt to content themselves with looking backward to the construction of olden times, both Classical and Mediæval, without attempting to bring the resources of their art to bear on the materials placed at their disposal by modern science, and while they had been thus looking backwards, the erection of a great many important structures had passed into the hands of engineers altogether. It was, however, out of the question that the art of construction should be in the hands solely of either architects or engineers. Both professions had plenty of work in their respective spheres. But it was greatly to be desired that the members of the two professions should work harmoniously together and should help each other. Engineers could aid architects in such structures of large span as had been described by Mr. I'Anson in his Paper; and architects ought to be able to assist engineers in making some of their constructions agreeable to the eye, and rather more "things of beauty" than we were often accustomed to see in engineering works.

The thanks of the Conference were then tendered to Messrs. Penrose, Waterhouse, and Street for permitting visits to be made to St. Paul's Cathedral, to the Natural History Museum, and to the new Law Courts respectively; to the Dukes of Westminster and of Sutherland, the Earl of Ellesmere, and Mr. Holford, for permitting visits to their picture galleries at Grosvenor House, Stafford House, Bridgewater House, and Dorchester House respectively; and to Mr. Kirkaldy for arranging a visit to his Testing and Experimenting Works in Southwark Street.

Evening Meeting: Bowes A. Paice, Associate (President, Architectural Association), in the Chair.

RUDE STONE MONUMENTS.

By T. Roger Smith, Fellow.

The nineteenth century will be remarkable for nothing so much as for the extension of our knowledge, it has overstepped boundaries which once seemed final; and among other extensions of our powers we for the first time possess the means of going back beyond the boundary which hitherto limited our knowledge of the past. Till lately our utmost range backward was reached when we came to the earliest written inscriptions and books. We are striving to extend our retrospect into pre-historic life, which now forms a chapter of the deepest interest in that new volume, if I may so term it, of the book of knowledge which modern research is placing within our reach.

Fresh attention has also been drawn to the objects of this evening's Paper; objects of a kindred character, so conspicuous for the most part that they can never quite have escaped notice, but yet many of them remote and obscure. Stonehenge of course has not been discovered as the Swiss lake dwellings or the English bone caves have lately been; but now that we are able to say something definite about the manners and customs, the life and arts of people who lived in those lake dwellings and haunted those caves, and who lie altogether outside the pale of history, our attention is afresh attracted by an architecture, if you will permit me to call it so, the origin of which is equally unknown if not equally remote. This evening, then, I invite your attention to a series of structures comparatively neglected, though within easy reach of our doors; possessing all the charm of mystery and not a little dignity, solemnity, and impressiveness. In short I wish to induce you to look upon these works as really and truly having a claim to be considered architecture, and as possessing some qualities which, if we could but transfer an equal amount of them to the edifices which we ourselves erect, would greatly add to their value as works of art.

If I here for a moment linger over that which has come to light concerning pre-historic men and their ways, it must be distinctly understood that I do not wish to imply that the structures belong to any special pre-historic period. The oldest flint implements are no doubt far older than any such structures as we are to consider; but at what period subsequent to the most remote, any of them were erected remains a matter for discussion. Mr. Fergusson who has with great care collected the facts and has published them in an admirable volume, argues in favour of the date of the majority at any rate being comparatively recent, in fact within historic times; but with the very greatest respect for Mr. Fergusson's invaluable investigations, I must be permitted to say that it remains possible to claim a remoter antiquity for these works and to advance good reasons for making the claim. It seems fair, therefore, without attempting to state any arguments in this controversy, if controversy it can be called, to point out that we really know something with regard to other work done in times which undoubtedly were pre-historic.

The earliest human remains in Western Europe are found in spots that have not altogether ceased to be the property of the geologist. At Dinant in France, for example, caverns are found high up the sides of the valley of the Meuse, where human remains are mingled with the bones of the mammoth, the cave bear, the hyæna, and the reindeer. At the period when these caves were the habitation of man, the Meuse we are told was three miles wide. Vessels of clay, not burned, small ornaments on bone and pebble, and roughly formed implements of flint, are found here. Similar discoveries have been made in many parts of Western Europe, and the remote period whence these things date is known as the rude stone age. After the lapse of time enough to permit the waters of the Meuse to sink till the stream at Dinant was but four hundred metres wide, the mammoth and hyæna became extinct, and in caves lower down in the same valley (which were under water and inaccessible before) traces of human habitation are again met with. We now find only the bones of animals belonging to existing species, and the traces of human handiwork are more advanced, still however, belonging to the stone period. Yet further down the sides of the valley, in positions indicating a less remote time, one when the river had almost shrunk to its present width, weapons of *polished* stone are found, and with them pottery, ornaments, and implements showing far greater skill in handicraft. The people who had reached this stage are said to have belonged to the age of polished stone. In the caves nearest the present level of the water, which has now decreased so that the river is thirty metres wide, objects of bronze are discovered, and these, often elegant, wrought with great skill, and serviceable for many purposes both of use and ornament, mark what is recognised as a third period, that of bronze.

The same sequence of rude stone, polished stone, and bronze is found in other spots where the habitations of man have succeeded each other for long ages. For example, on the margins of many Swiss lakes dwellings, forming little islands, have stood for ages on piles driven in a short distance from the shore. The remains of some of these have been laid bare and the heaps of rubbish thrown into the water by their inhabitants have been turned over, and have yielded, together with enormous quantities of broken bones and other debris, bronze articles near the surface, polished stone articles lower down, and weapons of rudely chipped stone at the bottom.

Visitors to the Paris Exhibition who can command a few hours and run down to St. Germain, will see in the ancient castle a splendid collection of works of these three periods. On many accounts those of the bronze period are the most interesting, they are surprisingly numerous, they are very varied in their design and contrivance, and circumstances seem to show that they were made and carried about for sale by parties of strangers, who it is conjectured came from the East, and who wandered over Europe with their wares like gipsies. It need hardly surprise us that in many cases we have no remains of the dwellings of these people. If perchance some fragments of our own public buildings might survive two or three thousand years of neglect, no one in this room will believe that a single brick of our dwellings would be left after such a lapse of time. We have, however, some structures in rudely shaped stone which have every appearance of being burial places, and others which we cannot but suppose have possessed either a sacred or a monumental character, and the discovery in or near some of these monuments of implements in polished stone and bronze, is one of the strong arguments which those use who would carry back the date of our rude stone monuments to the pre-historic bronze age or even the age of polished stone.

Mr. Fergusson has divided the objects he includes under the general name which stands at the head of this Paper into five great groups :—Tumuli, that is to say mounds ; (2) Dolmens, that is to say table stones, popularly but incorrectly called cromlechs ; (3) Circles ; (4) Avenues ; (5) Menhirs, that is to say, standing stones. I propose to follow his divisions, but to dwell chiefly on what I have been able to see myself, and on objects of which, thanks to the kindness of Sir Henry Dryden, Professor Hayter Lewis, Mr. Payne, Mr. Blashill, and other friends, I am able to offer you some illustrations.

The simplest monuments actually made of rude stone which present themselves are the small stone mounds or tumuli often called cairns. On the summits of the Welsh hills they are to be found in numbers, they are there perfectly circular, of considerable size, of a regular conical shape though not very steep, and often possessing a well marked cup-like depression like a crater at the summit. They are to be found also in many parts of Great Britain, especially in those localities which are naturally a little difficult of access. In some cases cairns and mounds must have been intended to serve some other purpose than that of ordinary sepulchres, as many of them are of enormous size, and must have consequently commemorated either the burial of one great man or of a large number of people, or some great event. In Wiltshire there stands what, I believe, is the largest of these mounds which Great Britain contains—it is called Silbury Hill. It is circular, and according to Mr. Fergusson, no less than 552 feet in diameter at its base. It rises with a regular well formed slope to a height of 130 feet, and has a flat top 100 feet in diameter. Nothing can well be more striking than this magnificent mound, which commemorates we know not what, but seems certainly to have been a memorial or monument. Excavations have been made in it, but no discovery of human remains is recorded. When I said that Silbury Hill was the largest of these mounds in England, I ought perhaps to have said the largest untouched one, for in several instances they were occupied during our troublous historic times as good spots on which to build a castle. Basing

House, near Basingstoke for example, stood upon an ancient British mound. It has even been suggested that the vast mound now crowned by the great round tower at Windsor Castle was another.

The more moderate sized cairns have frequently proved more really worth examination than the very large ones. Often on opening them some sort of stone chamber, often termed a cist, has been found, constructed more or less rudely in the very heart of the cairn, and whether such a chamber exist or no some relic or other generally repays the explorer. The next remains are Dolmens. These seem to be closely allied to the stone chambers in the heart of the cairns just alluded to. A dolmen in Gaelic (or in the ancient Bréton tongue which is closely allied to Gaelic) means table stone. Such a structure always has a flat stone at the top, and this is supported sometimes by three upright stones standing well apart, and sometimes by three or more flat stones forming the sides and end or ends of a chamber. A dolmen is sometimes prolonged, forming an oblong chamber, and sometimes has a passage walled and roofed in stone as an access to it. One in which a man can stand upright is a very large one, and yet from the enormous thickness and bulk of the masses of stone used in its construction, a dolmen with a chamber of very moderate size is a most impressive and dignified structure. Many dolmens are buried in mounds of stone or earth, others are perfectly visible at the present day, and it is a question on which antiquaries are not agreed whether these last were not covered with mounds, or at any rate were not formed with the intention of being so covered. I do not know that this very much matters for my purpose; what I want to point out is that these unknown constructors, who may not have cared so much as we do for the artistic effect of their works, raising structures where they had the advantage of the natural forms of unhewn stone, and constructing them as solidly as they knew how, put into them a perfectly lavish expenditure of labour, and an enormous excess of strength, and doing so have accomplished what few trained architects have even approached. They have produced works the appearance of which has a solemnity, a dignity, and a power almost, if not quite as touching and as impressive as the grandeur of the finest natural rocks or caves. Dolmens are not unknown in this country; there is for example one not far from Maidstone known as Kitt's Cotty House. There are several fine ones in Anglesea, and there are many in various parts of England, Wales, Scotland, and Ireland; but to see them at their best you must cross the channel and traverse the north-western corner of France reaching the wild south-western coast of Brittany just north of the mouths of the River Loire. Here you are in the district called the Morbihan, and I shall ask permission in describing what is there to be seen to make use of some notes written by me during my visit there, as although they have seen the light before they are more likely to be graphic than anything I could now write.

"The Morbihan is an unfamiliar name in England, and the Department of France which bears that name, and which forms the south-eastern portion of Brittany, does not lie in either of the routes usually taken by the bulk of English travellers in France, yet it possesses attractions of no ordinary description, being famous amongst antiquaries for possessing what Mr. Fergusson describes, and with justice, as 'the most remarkable group of megalythic remains not only in France, but perhaps in the whole world.' Names in the Morbihan are all striking; they are all derived from the ancient tongue of Brittany, and fall upon the ear with a very uncouth sound. Karnac, Lockmariker, Plouharnel, Quiberon, have an unmistakably different ring from the ordinary titles of French towns and districts, and one which harmonizes well with the unspeakable strangeness of the objects which await the traveller. The air is pure, the country picturesque, and the seaside life of the fisher folk must still retain not a few of the aspects presented by the ways of those far remote people who raised the stones and carved the undecypherable emblems which have lasted so long and are so full of mystery.

"The number of dolmens in this district is very large, so much so that in the course of a single day, much of which was taken up in other ways, nearly twenty were visited by me. Usually the chamber is large enough to stand upright in without difficulty, and is roofed by one enormous slab of granite; the entrance passage where that feature occurs is not so high as the chamber, and in many instances it is necessary to crawl on hands and knees in order to explore the interior.

"Near Erdeven a group of three dolmens exists, all of which are enclosed in one mound of earth; and when some years ago these were first opened many curious objects were found, such as axe heads (celts) in fine hard stone, and ornamented in gold. Many of these objects are still preserved in the best room of a little village inn on the roadside hard by. These remains lie thickest about the peninsula of Quiberon, a rocky tongue of land, which lends its uncouth name to a bay of some size, crowded with islets large and small, very favourable to the cultivation of oysters, and so furnishing plenty of occupation to the hardy fisher-people who live in the village, or are scattered about here and there in sheltered nooks. On crossing this peninsula from its western side near the village of Karnac to Lockmariker on its eastern shore, a singular variation in the dolmens is discernible. At Karnac there is hardly a dolmen upon which any sculpture can be discerned, but at Lockmariker, less than ten miles distant, it is constantly met with. The finest of these sculptured dolmens is situated on an island a mile or so east of Lockmariker, known as the Goat Island, or in Bréton, Gavr' Innis.

"The dolmen is under an enormous mound of stones. It is totally dark within, and is under the charge of a guardian, who provides a light, and has the key of a rude door which has—perhaps prudently—been fitted to its entrance. On passing this door we find ourselves at once in a straight passage rather more than forty feet long, and about five feet wide, terminating in a chamber about eight feet square. Both the passage and the chamber are formed of granite slabs, and roofed with the same material, the chamber being almost entirely covered by one single stone of enormous size. The passage is high enough to stand upright in, and the chamber is higher; in both cases the roof is of plain stone and nearly level. The great wonder of the place, however, lies not so much in its size, or the largeness of the blocks employed in its construction, as in the sculpture which covers its sides. From entrance to chamber every stone on both sides is carved, and most of the stones are completely covered with carving. The objects represented are few—that is to say, there is but little of the sculpture which can be recognised as representing things with which we are familiar. A few celts, *i. e.*, axe-heads, are very distinctly visible on one of the slabs, and a very fairly distinct representation of serpents is found on another; while a third appeared to me to bear what was intended as a somewhat conventionalised lily, both flower and leaves being tolerably distinct. The bulk of the decoration is, however, entirely made up of curling lines; circles within circles meandering over the whole surface, and executed in firm, bold channeled lines of considerable breadth and depth, and in fairly true curves. The marks conveyed to my mind the impression that they must have been laboriously produced by some scratching operation, and not with tools in any way analogous to a chisel and hammer. Without pretending to say that the resemblance is close, there is an aspect about the whole sculptured wall, especially when looked at rather in the mass than in detail, which recalls the sea. Nothing could well be more probable than that these coast people building this splendid structure, whether tomb or not, on a sea-girt island, should desire to imitate the waves of the ocean; and the endless succession of curves and wavy lines is perhaps quite as good a representation of them as could be expected from persons with a very rudimentary power of drawing, working on a most intractable material, and with tools that in all probability required the expenditure of immense labour to produce even a moderate result. There is, however, a veil of

mystery over these objects which has not yet been lifted, and which adds not a little to the wonder and pleasure with which the visitor gazes upon a work so strange, so rich, and so solitary, buried away in the heart of a vast stony mound, heaped up by hands long since forgotten, upon the rockbound shores of this tiny islet. By whom and when and for whom, one cannot but ask, was all this done, and what did it all mean?"

We now come to a series of remains which are essentially British, namely circles of standing stones; by this is not meant that such circles are exclusively British, but only that they are extremely numerous in this country, and that no other European examples equal the finest of our own. Stonehenge must be a familiar name to every one of us; but probably few in this room are ignorant of the fact that circles are to be met with in very many parts of England and Wales, especially in the most picturesque, or in other words, the least accessible districts. A very famous one, known as Long Meg and her Daughters, of which Mr. Payne has kindly given me some particulars in explanation of his plan, "is situated about six miles from Penrith and about one mile from the little village of Salkeld, on a site nearly level, but sloping a little to the south-east, and with a fine view of the great moorland mountain of Cross Fell. There is only one circle of stones to be traced, the arrangement of which will be seen on the plan. The only rule in placing the stones seems to have been to place them further apart when large and closer when small. Here and there are stones considerably larger than the rest—these are shown by a cross on the plan, and the dimensions of some of the principal stones are also given."

Circles occur of all sizes, from 10 or 12 paces in diameter to about 100 feet. On the Derbyshire moors and the Welsh hills they are often met with, and if many are famous others are little known. I have myself found a small circle of large flat stones, of which about two-thirds were still erect, while the remainder lay as they had fallen on the top of a grouse moor, near Chatsworth in Derbyshire, and I could not find that any resident in the locality was aware of its existence. There is a fine circle of stones about 100 feet across near Keswick; and a good example of a stone circle, though much ruined, exists on the southern slopes of Penmaen maur in North Wales, a mountain which also shews traces of a stone rampart, enclosing a camp at the summit, and retains several well formed cairns—that is mounds of stones. Such circles consist of large stones, as a rule, of tolerably uniform size and not unfrequently flattish, set up on end, buried sufficiently in the ground to obtain a foundation, and standing a short distance apart. Very often a circular mound encloses the stone ring. In my little Chatsworth circle which was thirteen paces—or say 45 feet across—these stones were all flat, averaging 2 feet to 3 feet wide, and those which remained erect stood about 3 feet or 3 feet 6 inches out of the ground, with the spaces between them about equal to the width of the stones themselves.

The most famous stone circle in Europe is in Wiltshire, and is familiar to persons who know nothing whatever about the numerous megalithic remains of other kinds to which it is allied. Of course I refer to Stonehenge. This fine monument strikes me as being one of the most impressive and telling structures for its size that I have ever seen. Few illustrations of it convey any adequate idea of its appearance, though you may obtain a very good notion of its general arrangement from plans, photographs and diagrams. Stonehenge stands quite alone upon a high part of Salisbury Plain, a desolate rolling kind of down with no house or tree near it. It was surrounded by a circular earthen mound, which if it ever was high has been very much washed or worn down by weather and time. This was 100 yards across. In it stood a great circle of high stones, tolerably square, and (speaking from memory) about 15 feet high, and connected together by horizontal stones going from one to the other. Within this circle was an inner and higher ring, not quite circular, but of a

horse-shoe shape, formed by ten very fine lofty stones planted in five pairs, and each pair united by a stone laid across the top of both. These stone posts and lintels are worked with two cup-shaped hollows in the underside of the lintel, while two corresponding projections are formed on the ends of the uprights, and fit into them, forming tenons and mortices. There were also a considerable number of tall stones, but of less height than those described, which are of a blueish granite, and must have come from either Cornwall or Ireland. These are most of them overthrown, and of the larger and heavier ones a considerable number have fallen and strew the ground. Still a very large proportion remains standing—grey with age, weather worn, yet stoutly erect—to testify to the great skill and energy of these unknown inhabitants of our island—our predecessors certainly, perhaps our ancestors—who raised them. It is hardly possible to exaggerate the impressiveness of Stonehenge, and this of course is greatly increased by our entire want of certainty about those who erected it, and the object which they intended it to serve. I think it not at all improbable that the enclosure may have been completed by woodwork between the stones and may have been roofed, which could not have been a difficult matter to those who could master the very great difficulty of putting up the stones. If so, it is more than possible that to us its appearance as a ruin is more dignified than the aspect it would have presented had we seen it when it was a completed building, with a large amount of timbering partly encumbering the stones; but however this may be its actual impressiveness can hardly be exaggerated.

There exists in the same county (Wiltshire) another monument which is more extensive, and far more ruined than Stonehenge, and which, when complete, must have been hardly less astonishing—I allude to Avebury—very near to the large mound, which bears the name of Silbury Hill, and which has been already described.

Avebury consists principally of an enormous enclosure, very nearly but not quite circular, formed by an artificial trench, outside of which is raised an enormous rampart of earth. Although time and the interference of the inhabitants—for a village is built within the circle—have very much damaged this rampart, enough of it remains to shew that it was a surprising work, rising to a great height and of enormous thickness, and with well marked entrances. This earthen enclosure was about 1200 feet, that is to say, 400 yards, or not far from a quarter of a mile across. Within this was constructed a ring, consisting, when complete, of about 100 enormous stones, but for our knowledge, of which we are largely indebted to Sir Richard Colt Hoare, a distinguished antiquary, who published an account in 1812, for the farmers have between that time and this thrown down and destroyed the greater part of the stones which were erect in his day, partly as an amusement, partly to get them out of the way, and partly for cutting up into building stone. Within the space enclosed by the great earth rampart and this circle of large stones, two circles of stones, not symmetrically placed and each more than 100 paces across, were formed. Enough of the stones which formed these is standing for us at the present day to trace them out, though their grandeur has been very much ruined.

But we have not yet done with this Avebury monument. It was approached up an avenue about 50 feet wide and three-quarters of a mile long, and made of very large stones standing in pairs. When I say very large, I mean blocks 20 feet high or thereabouts, and some 4 feet square. Even in its ruin, this avenue is very impressive; and though most of the stones have disappeared, and many of those which remain have been overthrown and now lie flat, there is quite enough remaining to shew that our obscure forerunners had their own ideas of dignity and impressive effect, and were quite equal to the task of carrying those ideas into effect on an enormous scale.

I am now, having been led to the subject of stone avenues by the Avebury one, going to ask

you to cross the Channel with me once more and return to Brittany. Here you will encounter no circles, but stone avenues even more remarkable than the one at Avebury, and stone pillars of great size :—

"The spot which we will first visit is Karnac, a very small French country town already alluded to, a mile or so away from the Bay of Quiberon. Here is to be found the most remarkable of all the pre-historic monuments of Brittany, namely, a series of avenues of stones extending over miles of country; and, notwithstanding the attacks of time and the worse damage inflicted by human force, still in a state of admirable perfection. These avenues are not single lanes of stone, like the great one at Avebury, but are disposed side by side, and formed by rows of large stones, so arranged as to give ten or twelve parallel lines. The distances apart vary to some extent, but average about ten to twelve paces, so that where there are ten avenues the width of the monument is something more than a hundred yards. Three such series of stones succeed each other, extending in a curved line over a space not less than two miles, and in each case beginning with stones of moderate size and somewhat irregular spacing, and proceeding to larger and more evenly placed stones, and on to still larger ones, until the series ends with a row of very large stones indeed (as much as 20 feet high each), very evenly ranged. Towards the head of each series the avenues are strongly marked, perfectly regular, and in many places so well set out that the stones give true lines when looking either directly across or diagonally over the group, as well as when looking back from the head of the series towards the beginning.

"It is impossible to convey to those who have not seen the thing itself anything more than a very meagre conception of the arrangement of these stones, while to give any notion of their solemn, wild, unearthly, impressive dignity, standing alone, grey and weather-beaten, on an open breezy heath, is simply impossible. The first series of avenues, called the lines of Kerlescant, run almost true east and west, though their lines suffer a slight bend. Where they end occurs an open space of considerable size, now partly occupied by a fine plantation. This has been enclosed by a mound on the north, and by very large flat stones, placed on edge and close together on the other three sides; and of these, perhaps, one-fifth are standing to the present day. Thus, when complete, the arrangement of this part of the monument was that the parallel avenues should lead up to a large enclosure of square shape, dominated by a mound.

"Proceeding farther towards the west, an interval of perhaps 500 paces separates the enclosure just referred to from the beginning of the second series of large stones. In this interval no stones occur, but when we have passed it we begin to recognise the commencement, at first not very distinct, of a new series of avenues. These, after a short time, become once more unmistakably traceable; but this time they run in a direction about south-west. As before, the regularity of arrangement grows to be more marked, and the average size of the stones is greater as we proceed along the monument we finally reach still larger stones, and when we come to the front it is formed of fine upright blocks of granite (the material of the district) spaced and ranged with much precision.

"If there ever was a stone enclosure here most of the traces of it have been removed, but there are several stone buildings forming the hamlet of Kermario, and including a mill hard by, and the thin stones which would have been used to form an enclosure had there been one, may have served as a quarry. This is, however, a mere conjecture; certain it is that the principal object now visible is a half-ruined stone dolmen of great size.

"Again an unoccupied space has to be traversed; and bye-and-bye a third series of stones is begun. This, like the Kermario lines, of which it is a direct continuation, runs in a south-westerly direction, and it continues till near its front the finest and largest stones in the whole series are met with: the

front line includes several magnificent monoliths, certainly approaching 20 feet in height. The termination of this third series of avenues was an enclosure, similar in position and construction to the one at Kerlescant, but which had, as far as can be made out, almost a semicircular shape on plan, the chord of the semicircle forming the face of the avenue. A hamlet named Maenac has, however, been so built that many parts of this enclosure are interfered with, and it is only with difficulty that it can be made out.

"Mr. Fergusson's theory is, that these stones are a memorial of some great military triumph, and represent an army on the march and an army in order of battle; but others feel that the constructors of these astonishing structures appear to have had an idea identical with that which the ancient Egyptians developed so grandly by the aid of appliances evidently quite unknown to the rude architects of this megalithic monument. An avenue of permanent objects has been employed in both cases to lead up to a sacred enclosure; and it seemed as if, in the absence of any other power of adding to the dignity of the objects of which the avenue was composed, these ancient people had determined to gain nobility by increasing the number of avenues.

"At a distance of some two miles and a half north-west of the Karnac monument stands the similar one of Erdeven, and the whole intervening space bristles with large stones and dolmens, sufficient at any rate to show that the entire region was one where the inhabitants desired to establish memorials, even if the intervening stones were not intended in some way to link the two monuments together. In the Erdeven monument, we have a series of avenues formed by ten to twelve lines of stones, running nearly due east and west, and extending about a mile. The lines in this enormous monument are weakest near the centre—that is to say, the stones there are the smallest and the spacing least regular. They are distinctly marked as they approach the east and west ends, and are terminated at the west by a series of very fine stones. The monument is not, however, so striking as those at Karnac: it has been more interfered with by cultivation and by the destruction of the stones of which it is composed, and if it led to any enclosure at either one end or the other, there seem now few traces, if any, of such an object. Two or three isolated groups of large stones stand in its neighbourhood, and if a clue is ever found to the arrangement and intention of the whole, these groups must be taken into account.

"One other description of rude stone monuments is found in Brittany, namely, an isolated standing stone. To this is given the Bréton name of Menhir; and were it not that the grouped stones in this district are so interesting as to eclipse all other objects, there are sufficient solitary Menhirs in the neighbourhood of Karnac and Lochmariker to attract the antiquary. One such stone, at least, must not be omitted from a notice, however hurried, of the wonders of the Morbihan, a stone which one cannot look upon without astonishment, even although it is now prostrate and broken into three pieces. It lies in the outskirts of the hamlet of Lockmariker. When whole, this Menhir must have exceeded 60 feet in height by about 12 feet across,—that is to say, it was nearly as high as Cleopatra's Needle and more bulky, so that it was quite as unwieldy and probably quite as heavy; and if we consider what a feat it is for people who can command iron tools, steam engines, and all modern mechanical aids to quarry, transport, and above all, to set up an obelisk of this size, we cannot but be filled with wonder when we behold this mass, which the unknown forerunners of the present fisher people must undoubtedly have prepared and transported to its site and set up."

In bringing these remarks to a close, I have to confess that I am perfectly aware that they present only glimpses of a great subject, and give a fragmentary and imperfect account of what might have been much more systematically put before you. But I have confined myself almost entirely to what I have actually seen, and have mentioned nothing which is not easily and pleasantly

within reach of you all. The object of this Paper is by no means to tell all that is known about rude stone monuments, still less to involve you in archæological discussions, but to describe a few of the most imposing specimens, and especially to show that they possess qualities which make them well worthy the attentive study of architects. There is probably no building of the same dimensions so impressive as Stonehenge, and it would be hard to conceive of any mode of making use of great space to such advantage as at Karnac.

We cannot take leave of these monuments, and especially of the noble ones remaining in our own Islands, without feeling some pride in the work of those far off people, whoever they were and whenever they lived, who once had as much right as we now have to call these western lands their own. It is not a little pathetic thus to interrogate memorials which have been struck dumb by lapse of time, tombs of we know not whom, monuments to commemorate we know not what. But for us living in the full glare and busy rush of a civilization which, if enlightened and advanced, is not the less tumultuous and distracting, it is almost refreshing to cast our eyes back into the darkness of the far-off past and to try to fancy who and what the men were who erected such astonishing structures; and I am not without the belief that, if we realise how well they did this work, it may prove instructive also.

ON THE ARCHITECTURE OF TROY AND OF MYCENÆ.

By J. S. Phené, LL.D., F.S.A., F.G.S.

Although it must of course be apparent that before an architectural audience I should confine myself to the architectural features of my subject, I must claim the privilege of referring to that necessary limitation, as the matter is one so teeming with history, poetry, and the early dawn of civilization; so full of ethnological and antiquarian interest independently of these points, that it must be understood my reticence arises from this imperative barrier, and not from want of search in other directions of science. With the names of Clark, Cockerell, Dodwell, Gell, Leake, Pennethorne, Penrose and others fresh, ever fresh, as they must always be in our minds while on the subject of Greece, nor omitting our own Professors, Donaldson, T. Hayter Lewis, and James Fergusson, it may seem presumptuous in me to enter on such a theme. I do so, however, by invitation, and therefore need offer no apology. But it is impossible to travel over ground so ably, though not frequently trodden, without, to an extent, imbibing the ideas of those who have gone before me, and so perhaps unwittingly borrowing from them. I may be permitted, I trust, also to point out that, had the actual title of my Paper been submitted to me as that intended for the printer, I should have requested that it might rather refer to the architecture (such as we have of it) of which Mycenæ and the Troad give examples, than the geographical limits of those places, within which I cannot possibly confine myself, if I am to make my meaning evident.

In these works our business is more with the builder than the architect, we must therefore consider the procuring and erection of the material, and I shall deal with the practical as much as possible. The first thing that engages the eye of one interested in construction, after the awe which these ruins, even now, inspire (literally delivered as they are to the mole and to the bat, not a herd-boy harbouring in the enormous, and so-called, demon built piles of the Cyclopes, a grand reason for their not having been despoiled) is that the architecture consists of extreme opposites, though of probably the same long existing period,—the enormous masonry of the earlier walls, untouched by

any tool, either in quarrying or erection, and the equally enormous masonry wrought to perfection and even polished at Mycenæ, of which slight traces are also found at Tiryns.

Going to the most primitive style of Cyclopean work, I must first refer to an observation often made by others, but I think not yet applied, viz., the great tendency of the stone used by the Cyclopean builders to fracture into the forms found in their masonry. Two points stand out here very prominently. A large amount of economy in the even then Herculean work; and a sort of visual protectiveness, which, in primitive man, would assume the attitude almost of an operation of instinct. On the first of these, while it is undoubtedly true that, as in the case of Tiryns and some of the parts of Mycenæ, the blocks are so vast that, as described by Pausanias, they would take a yoke of mules to draw the smallest of them, yet whether by mules, oxen, or men the draught is merely a matter of multiplication; the severance of the blocks from their native beds, startling as it appears at first, from their magnitude and irregular forms, so unlike the rectangular which we associate with quarrying, is relieved of much of its mystery, in face of this tendency to fracture. Nor does the economy cease there, an almost inexplicable feature is at once met, viz., the enormous periods, which may be counted probably by many decades of centuries, during which the architecture of these rude builders, without buttresses, cement, or any kind of bond, has retained its original and vertical elevation though visited by innumerable earthquakes. The removal and replacement of the blocks in consecutive order would at once account for that wonderful inter-fitting, and natural bonding which amazes the eye, and by its results takes the reason by surprise.

The mere change of the beds from a vertical to a horizontal position being all that was needed to produce such results. I am referring here to effects arising from the natural fractures I have noticed, which occurring on more or less level surfaces proceed vertically downwards, often representing polygons like those of basalt. The lateral denudation of such a bed being effected, these crevices would form ready receptacles for the introduction of wood, and its subsequent saturation—the most primitive of all such applications of force—would simply cause one after another of the already interstitialed blocks to fall into the hands of the operators without the use of any tool. The original vertical position of the blocks being made longitudinal, their natural irregularities, with superincumbent weight added, would form a toothed bond capable of resisting till the stone disintegrated, which the material they selected never appears to have done to the extent of weakness. In many parts the blocks are laid as in modern brickwork of headers and stretchers, and equal bearings obtained (as has been often remarked) by the insertion of small blocks of stone in the cavities. Eastward of Tiryns I repeatedly came in contact with rocky elevations actually scaled of their former surfaces. The raising of these vast blocks appears equally surprising, but is as easily disposed of; for, in almost every case, as at Tiryns, Mycenæ, Argos, Samothraki, Sicyon, and even at many of the Cyclopean works in Italy, I have found the wall acting very largely as a retaining wall, in many cases coating a perfectly natural elevation, as at Mycenæ; and in others, as at Tiryns, having the intervals between the natural hill and the wall filled in with earth; so that the principle of an inclined plane could be generally applied. Remains of such planes are still found, as shown on diagram.

In Sir Wm. Gell's description of Tirynthus, we have an example of such an inclined plane. He says: "A sloping way fifteen feet wide ascends from the plain. At the summit of this," he adds, "are *tremendous blocks of stone*," one being given as ten feet six inches long. Dodwell says: "The walls are constructed upon a straight line without following exactly the sinuosities of the rock." It is evident we have here the need for the earth to fill up those sinuosities to a level surface, as was done, which earth, till so disposed of, would form material for an inclined mound. The walls

however rose, some think, to sixty feet from the plain. There is not sufficient fallen material, I think, to account for this height, and as there is abundance of stone everywhere there would be little quarrying in the ruins by later builders. Putting the height at from forty to fifty feet and taking the thickness of the walls (as from my own measurements I know they are) at from twenty-one to twenty-five feet, it is clear an inclined plane would only be necessary at any given point, and the block once raised could be drawn over a tramway of trunks of trees on the wall to the desired position.

While on these primitive questions I had better discharge the second point—the visual and instinctive protectiveness. Like all cities these ancient remains must have been progressive, indeed, their progress is apparent. Thus at Mycenæ the upper Acropolis clearly formed the ancient citadel, and the elaborate approach gate of the lions and the lower Acropolis evidently a regal and sumptuous adjunct. The circular agora is greatly posterior to the upper Acropolis, but the smoothed stones do not imply necessarily a later date than than that of the lower Acropolis, as Homer refers to such stones as smoothed or polished. From careful observation I have come to the opinion that we have here the very earliest style of stone construction in Greece, and that an ancient and probably independent city existed on the hill forming the Acropolis, and that the foundation of Mycenæ, as mentioned by Aristotle, for sanitary purposes, referred to the lower Acropolis, the gate of the lions, and the still lower city. Though that the sculptured stone which gives the name to the lion's gate is a production of foreign art workers, I make no doubt, it is not imperative that it should be of later date. The whole execution of this part is much more artistic, and though not strictly rectangular, sufficiently approximating to it to show a great advance in art, or the employment of more skilled workmen, while it retains sufficiently the features of the huge blocks and rudely fitting joints to show that an improvement only and no new method had been adopted.

Taking then the upper Acropolis as an example, without the enormous lithic works proceeding from the lower Acropolis to the valley beneath, there would be, in the mural arrangement, little to attract the eye, and possibly a roving predatory horde, or the more civilized and artistic Egyptian might have passed it as unobservantly as an Arctic hunter might overlook a white fox, or a hungry bird the leaf-like mantis. With an invertion of intent the simulation of art by natural features was sometimes used in the Middle Ages, as at the fortress of Josselin in Brittany, where the structure follows the sinuosities of the rock it stands on, and the rock beneath is scarped and cut so as to carry down the appearance of the building to the river, and so give the effect of an enormous structural elevation. But let us examine their designs. Tiryns, which is certainly older than the lower Acropolis of Mycenæ, has a grand bastion-looking work on its west flank. But I find from examination of the natural and rocky hill which forms the Acropolis there (if such a name may be given to so slight an elevation) it arises simply from enclosing a projection, the cutting away of which would have been laborious, while the filling up of the interval with earth, had the wall been continued at its greatest projection, would not only have been equally so but would have presented a less solid backing to the northern portion of the west wall. Assuming the stone was procured as I have suggested, it would only be so procurable a few feet below the surface through fissures of weathering, and being extremely hard the unfissured and denuded rock would present a formidable barrier, and like a useless object in a beehive, too difficult for removal, would be coated over. This may seem waste when the vertical rock would form a natural fortification, but it is one of the extravagancies the Cyclopean builders indulged in. At Mycenæ perfectly unapproachable vertical faces of rock, to the south-east of the upper Acropolis overhanging the ravine, are faced with Cyclopean masonry, which must have been executed with great difficulty and risk. Where a different object was to be attained these builders were evidently alive, as at Tiryns, to the

fact that a wall of masonry presented a more imposing effect than the bare face of a rock and would deceive an enemy as to what lay behind it. I am inclined, therefore, to think that this was not a bastion in our military sense, though its symmetrical curve and finish reflect as great credit on the constructors, as if it were. On the other hand it certainly screens a sallyport, but my impression is that the sallyport was the result of the projection, not the origin of it; for an aggressive party would doubtless come by sea and the bastion offers no protection in that direction, nor is its prominence such as to screen the occupants of Tiryns in any expedition of their own to or from the sea.

I say this with no disparagement to the constructors. I am simply not desirous to jump to conclusions from an (as it appears to me) accidental similarity. Nor does it affect the question of capability of design, because Sir William Gell refers to a tower of solid masonry, 20 feet square and 43 feet high, and Aristotle states these builders first erected towers and forts, which Theophrastus points out had their origin at Tiryns. The opening of the sallyport is at the level of the plain, and the effect produced is, that it issues from a vast tower, which, as the inner level is here about 35 feet high, did probably rise to the height of 60 feet, or, roughly, about 25 feet above its internal support, as the rock slopes inwards at a certain height.

The admirable and everlasting galleries of this fortress also attest a great amount of engineering knowledge. Notwithstanding this, and at the risk of heresy, I must conclude either that the galleries of Tiryns were of later date than the western wall, or that they were made by Egyptian artizans, or that a knowledge of Egyptian art was introduced. The formation of these galleries, though extremely rude, is yet entirely on the principle of the angular impingement which acts in lieu of an arch in the Grand Pyramid, and which is adopted in a modified form, and with a succession of courses, in lieu of discharging arches above the large lintels, over the "Gate of the Lions," the entrance of the "Treasury of Atreus," and of that excavated by Mrs. Schliemann, from whom I had a most graphic personal account of the work.

My friend the Rev. Dr. Thornton has drawn my attention to the fact that the "thrust" is exactly that which is used for a simile in the "*Iliad*," xxiii. 712, in which Ajax and Odysseus, found to be of equal strength in wrestling, are described as like "ἀμείβοντες"—the two beams of a house thrusting against each other; which leads to the inference that possibly the "thrust" in a wooden structure suggested the idea of this form to the workers in stone.

These discharging triangles may or may not have been kept open for light and air. Hence a stone like that sculptured, with the lions and column, could have been inserted afterwards in either case, for if closed, it is clear the obstruction was no part of the building.

The Cyclopean builders are recorded, by Strabo, to have come from Lycia, in Asia Minor, at the request of Prætus, brother of Acrisius, for the purpose of constructing for him the city of Tiryns. But the whole of that part of Asia Minor was in close commercial connection with Egypt by Phœnician and Phocæan traffic; so that, assuming this to be reliable history, it follows that the rude but efficient triangular arches in the galleries of Tiryns and Mycenæ, and over the lintels of the Treasuries, as well as the more finished architectural works of the latter city, were of semi-Egyptian art. This more finished but still rude quadrilateral masonry of Mycenæ assimilates to some of the masonry in the Temples at Thebes in Egypt.

The chambers of polished stones, referred to by Homer ("*Iliad*," vi. 244), show the art in that direction arrived at by the ancients, and the exquisite result of such labour in the underside of the broad lintel, formed of the hardest conglomerate, in the Treasury excavated by Mrs. Schliemann, and other examples, corroborates this in a striking manner; and Homer treats equally of Thebes and Mycenæ, and the Egyptians, we know, were perfect polishers of stone ("Herodotus," 2, 124). I think

Dr. Schliemann's suggestion that the heads of the lions were of metal most probable. I examined them minutely, and found careful cuttings in the stone, certainly not the result of demolition in removing such parts in stone.

On the point of date of the Tirynthian galleries, it is certain that that city shows additions to its original structure, as an evidence of which I produce a photograph (enlarged on the diagram) which also shows an ascent by an inclined plane. These additions, however, may have been made by the original constructors as the work progressed.

Approaching the remains of higher architectural art at Mycenæ, we must necessarily first take the walls. I made drawings of the wall abounding in polygons, near the postern gate : it unites the three earliest stages, and all the features of the Cyclopean. I am disposed to think that the well-fitting polygons of Cyclopean work originated in the same way that the rude but symmetrical angulation of the more primitive Cyclopean work did; that is to say, from natural polygonal fractures, which I have seen in abundance in Greece, some being near Charvati, the village which has succeeded Mycenæ. The view of Charvati, heading chapter 5 in Dr. Schliemann's "Mycenæ," exhibits in the quarry many untouched stones still *in situ*, having these quaint natural outlines. The sides of the rude natural polygons and also squares being rubbed down, produced, I think, those interesting forms; in other words, the irregular lines of nature were simply smoothed, and compactness being aimed at, the angles were made to agree with the adjoining angles during the process. Of course this was only in the primitive introduction of polygons ; this angulation in high Greek art of a later date being carried to great perfection, and abandoned sometimes for the exquisite curves found, as in the base of the temple of Apollo at Delphi, which curves appear to have been produced by a perpetuation of the same process of rubbing, though purely artistic in design.

This specimen of the Mycenæ wall almost indicates a first attempt, and looks as though an Egyptian workman had taken a turn at the work amongst the native labourers. Such slow process, though not suitable for erecting defensive walls, was nothing in face of the true lines and polished surfaces of the enormous slabs in the "Treasuries."

The great care in selection and adjustment of the stones required for coignes and other positions on which the permanent solidity of the structures depended, is shown even in the rudest Cyclopean work. At Tiryns it is very marked. At Ithica, in a gateway, of which the diagram exhibited is an enlargement of an illustration by Sir William Gell, it will be seen that, in the larger portion, much ruder stones are used, than in that part where a vertical thrust alone has to be resisted. This agrees exactly with the lofty Cyclopean walls I illustrated in the *Builder* of 18th August last year, as found by me at Samothrace, an island which has some beautiful progressive stages of Cyclopean work, ranging from the rudest irregular stones to the most careful polygons, in which we have an indication of the advent of the curve in polygonal masonry, finally succeeded by the grace of classic temples. An article by me, with illustrations, referring to this island is about to appear in the Athenæum of Athens.

While on the subject of Mycenæ and Samothrace, the double occupation of the Cyclopes crops up. Builders of cities and workers in metal, as in the latter case, were the Cabiri. How the stupid myth could have arisen with regard to them I cannot conceive. Its origin was simply the expression of to-day, common now with us, though an Oriental metaphor, with respect to steady, assiduous workers : they had *an eye* to their pursuits; hence their excelling. Just as it is applied in a much higher sense elsewhere, but still Oriental—"When thine eye is single, thy body [its works] is full of light [perfection]." With the ancients this, like many other teachings, became totally inverted to "the evil eye."

As art progressed, it was found that the friction of the close joint formed an excellent bond. I illustrated this in a short article on "Fiesole," in the *Builder* of 4th August last year, where a lofty piece of masonry, between three and four thousand years old, forms a retaining wall to a piece of elevated land. This wall I was able to examine minutely, in consequence of a small aqueduct having been allowed to get out of repair, and the soil being recently washed away had caused a portion of the wall to fall. In this case the wall had been built at an inclination of about 1 in 15 to sustain the outward thrust, but was only about 3 feet thick,—nearly uniformly so, with no bond or tie into the earth on its inner side; yet the part of the wall still remaining, and not affected by the water, was in its true and original position, although the joints are not nearly so close as much of the tetragonal Etruscan masonry.

The walls in the passage to the "gate of the lions" and to the "Treasury of Atreus" have this tendency to incline, which must, I think, have been derived from Egypt. The more so as we not only find an approximate diminishing proportion in the great gateways and doorways at Mycenæ, as well in the Acropolis as in the Treasuries, with recessed architraves of the same proportion, but also positive pyramids over the whole of the Argolic defences, and a pyramidal tendency near Troy (Bunarbashi).

I made a point of visiting all that remain of these strange buildings, which have been put down by some as places of confinement, and by Pausanias as armouries; but which, though no doubt occasionally used for those purposes, were, I find, outpost or small garrison towers, just as the "*brocks*" in Scotland and the "*nuraghi*" in Sardinia and Calabria were; and, curiously enough, with the same battering inwards towards the summit, whether square like the Egyptian, or round like the more western and northern structures.

In the Argolic plain, several of these pyramids, well recollected by my dragoman, Dionisius Dragonus—who I can most conscientiously recommend to any intending explorer, and who was as good as my guide in former years, Elias Polychronopulos, not now alive—had been removed since his former visits, for agricultural purposes, to clear the land and form erections. But further east, near Epidaurus, I found the second one mentioned by Colonel Leake, almost as perfect as that shown in the interesting sketch by Mr. William Simpson, amongst the drawings from Troy and Mycenæ, from his exhibition at Messrs. Colnaghi's; and a tendency to this pyramidal form of structure was shown in several ruinous remains in the route between the Argolic and Epidaurian districts: also in the opposite direction, on the western spurs of Mount Parthenium, near Hysiæ, almost as far as Mantinea, where I found polygonal and quadrilateral masonry mixed, and so on by Orchomenus to Sicyon.

I am disposed to think the ruins of rectangular buildings of Cyclopean work on the line of the broad street, and near the Cyclopean bridge, approaching Mycenæ, were similar structures, as they bear the same proportion of oblongs rather than squares, that these pyramids do, and their positions are just those of guard-houses. There is a similar guard-house in approaching Delphi from the east. I find the dimensions of this pyramid not exactly agreeing with those given by Colonel Leake, but his are sufficient for guidance. He gives them as follows:—48 ft. 6 by 38 ft. 7 in.; south wall, 9 ft. 3 in. thick; chamber, 23.5 by 23.2; passage, 3 ft. 9 in. wide; internal wall, 3 ft. 2 in. thick; to which add other external walls, 10 ft. thick at base.

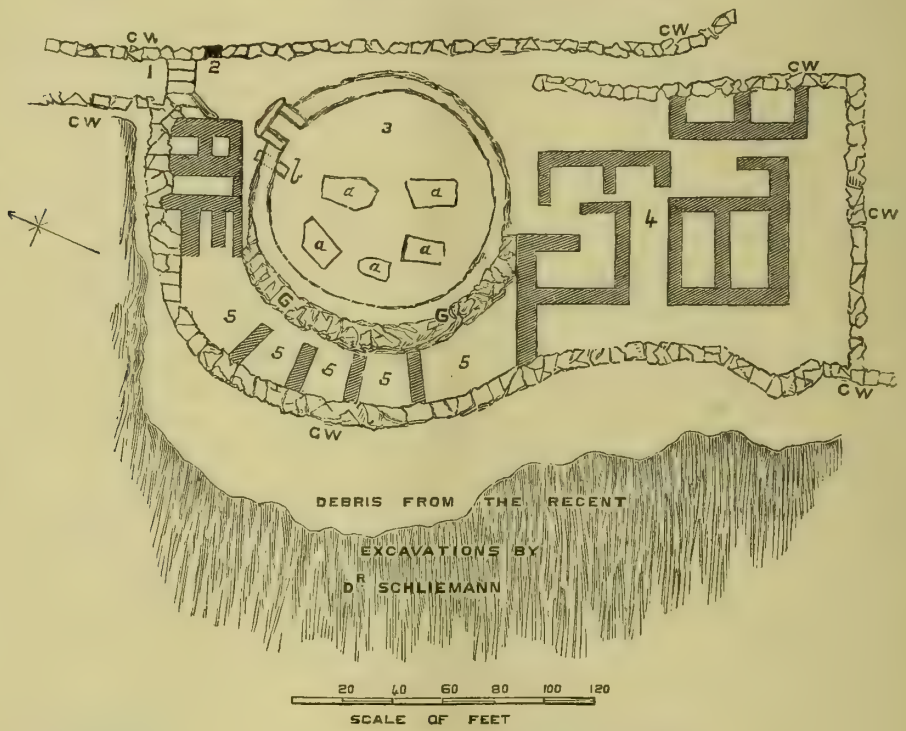
Triangularly roofed galleries, similar to those mentioned above, are found at Mycenæ, but in the time of Leake, this pyramid had such a gallery, so that being in the pyramid, I think the question of its being Egyptian, is set at rest. I found an imitation of such a triangular opening in the walls of Messene. In this pyramid and similar works in the Argolic district mortar is found in the walls, introduced subsequently for air tightening, and not in the original construction.

I cannot quit the subject of Mycenæ without a reference to the elevated road, ably dwelt on by Dr. Schliemann. This way, partly constructed by utilizing a natural elevation, partly by engineering works, which even in these days would be considered vast, if constructed without the aid of steam, has an amount of colossal cyclopean work which bewilders the beholder. Not only are the intervals so built up, but the rocky hill has been levelled down to the necessary easy slope for processions, seen from the Acropolis, of cavalry, or chariot display. The "Horse feeding Argos" supplied such doubtless, I exhibit a totem or symbol, I excavated on the plain, illustrative of the dedication of the horse. The remains of strong defences may still be traced on this road. It was evidently the "broad street" "εὐρυάγυια Μυκήνη" Il. 4, 52 referred to by Homer. It is approached from the Argolic plain by a cyclopean bridge formed of huge blocks, and winds up between temples, tombs, and treasuries, like a vast serpent, to the Acropolis, which, to carry out the similitude, forms the head. I have met with these simulations so strongly marked in some parts of Phrygia, that on pointing them out to fellow travellers, I have heard their expressions of unfeigned astonishment at their own previous want of observation in what was so manifest. The indications I refer to are very considerably more prominent than in the case of Mycenæ, a plan of which, from my own survey, appeared in the *British Architect* of the last year, much prior to Dr. Schliemann's publication. It may seem strange to quit Mycenæ without further reference to its grandest structures, the *Thesauroi*, but they are accurately described by others. The masonry of that excavated by Mrs. Schliemann exhibits, in a remarkable manner one example of the curious overlapping, or tendency to mosaic work, seen in the later cyclopean, and early Hellenic masonry. And, in the instance I illustrate, at an enormous useless expenditure of labour. The tendency arose from the early habit of filling interstices with rude blocks. Dr. Schliemann's excavations have, however, thrown light upon their principal feature. It is clear these "chambers of polished stone"—parts are beautifully polished—were circular courts for secret council, as the circular mural agora, which seems to have been preceded by a very rude structure of the same kind, the foundations of which still remain, was for common and open council. The *local* of that which they had to guard, would be the most fitting place for the secret councils held for its use and preservation. These treasuries appear to have been in use, as such, prior to the time when security for treasure was sought under the sacred *ægis* of an oracle. Dr. Schliemann suggests that the foundation I have referred to was built to support the circle of slabs. It has the appearance of being much more ancient, and is probably the lower part of the former agora wall. My description of this wall in the *Builder*, March 31st, 1877, was, that it was a domed wall, surrounding the five tombs, *i.e.*, the remains of a rude structure in the form of the "Treasuries." The wall has such indications, and its external supports lead to that conclusion. In any case, it is very ancient, and it may be that the uncovering the chamber of secret council, and the forming an agora, enclosing the known sacred place, yet having the natural rock rising in the centre, deceived despoilers, and so preserved the tombs.

One reason for describing the circular wall as part of a domed structure is, that, as shown in my illustrations in the *Builder*, three out of four of the buttress walls on the west do not touch the wall, and it follows that the support they gave was at a greater height, and that they impinged against the wall by a sort of flying buttress, formed probably by triangular arches, like those already described. The amount of earth filling up the level from the slope of the rock is small, and this wall could not have been built as a retaining wall for it, for the resistance to the thrust is not in a position for resistance to such a retaining wall. Indeed, it is studiously avoided, and as the result proves wisely, for the wall has stood thousands of years without any support, though this thrust has been augmented enormously by *débris*, weighted by rain, all drainage being destroyed. This thrust was so great that, judging from the natural conformation of the hill above, Dr. Schliemann

considers that the upper Acropolis has been denuded by the rains, and that the heaps of potsherds found in the lower Acropolis were brought down wth the soil, the whole thrusting upon this particular wall, which has not bulged in the least. Whereas, had it been higher, it must have been overthrown, unless there had been support from the buttresses at a level higher than its and their present elevations. The upper portions of these resisting buttress walls, with the arch thrown over, were no doubt reduced in height at the same time as the upper portion of the circular wall, whether the last formed the foundation to a dome, or was simply carried higher to form an earlier Agora. I think it probable that it answered both purposes, and that originally there was a domed chamber, afterwards reduced to an open agora, which latter was superseded by the agora of slabs upon its site. The curvature of the wall also indicates the commencement of a dome.

PLAN OF THE LOWER ACROPOLIS AT MYCENÆ.



C W. Cyclopean Walls.
a a a a a. The five tombs.
b. The sixth tomb discovered by M. Stamatáki.
1. Gate of the Lions.
2. Guard chamber.
3. Circle of the agora.
4. Probably the foundations of the palace.
5 5 5. Buttress walls to agora.
6 6. Foundation of former structure, probably domed afterwards, used as an earlier agora.

The material of which the slabs in the agora are formed differs entirely from any other stone used in construction at Mycenæ. It is a coral rag taken from some quarries I visited several times, in repeatedly going through the Tretus Pass. My attention was drawn to this from seeing a monument in that Pass formed of the same material as the slabs. The quarrying here was in the usual way, and not superficial. The quarries for the large masonry of the treasuries, may be yet to be found, or having been denuded of their weathered surface, they may have been worked horizontally at Charvati; but if so strong indications would be expected. The elevation utilized in forming the "broad street" must have afforded much material in the later works, which would have required comparatively little labour in removal to its present position, whether in the lower

Acropolis or the Treasuries. A large unmolested isolated rock at the southern end of this elevation shows the original conformation and the ease with which skilled quarrymen could have obtained the largest blocks without having to raise them from deep beds, or from Charvati. The limestone slab for the lions, shows that these art workmen sought their stone to suit the purpose it was to be used for. I cannot, however, leave the treasuries without drawing attention to a fact, which introduces a new class of workmen to our notice. These drawings, kindly lent me by Professor T. Hayter Lewis, exhibit a style of art of high class and altogether un-Egyptian as un-Grecian. They appear to belong to a decoration having nothing to do with the structure, but appended to it, and are, in my opinion, of the same date as the lions, the "tomb stones," and the friezes, the spiral designs on most of which assimilate. But here a new feature crops up, the patterns on the gold ornaments also assimilate. If we may look on the gold ornaments as part of the spoils from Troy, may we not look on this new feature of the worker in stone, as indicating art workmen brought by Agamemnon from that rich region, embodying all the art of Asia. The very slabs of the agora agree with the masonry which I found in the tombs beneath the mounds near Sardis. The work of the "tomb stones" is inferior to the decorative sculpture, but the one may have been executed with care to please the eye of the imperious conqueror, the other under slight supervision after his death. Dr. Schliemann thinks the Treasury of Atreus was decorated externally with bronze. The incisions in the face wall are large, and as the marble semi-columns were found attached, and sculptured mural slabs of marble found in the other Treasury, it seems probable the external decorations were throughout of marble. Professor Lewis's drawings indicate a Persian style: this would not affect the question, as there can be no doubt that all the art of Asia was known in Troy.

This remarkable enclosure of the agora at Mycenæ, and the many references by ancient Greek authors to that and other agoras enclosed by stones (sometimes polished), have a peculiar interest. The one prominent feature appears to be, as existing with us to this day, that the centre of the agora should contain the honoured remains of their great ones; as the modern church or cathedral, with its crypt and sepulchres, are still surrounded, except by very recent arrangements, by the place of civic assembly, the judicial court, the market and its occupants.

I draw attention to this because one of my principal reasons for visiting Mycenæ, was the comparison of the lithic enclosure of the agora, at that place, with a very unusual similar enclosure I had found the previous year in Brittany, on what (it is evident from geological survey, as compared with the geographical variations shown on the coast of France, generally, by Monsieur Ernest Desjardins, of the Institute of France), must have once formed a portion of the Isle of Aval or Avalon, which has been divided into two portions by the sea, through which fact the name has almost been lost, the very small portion retaining the original name, Aval, while the large portion by a natural sequence, has been called the *grande* or Great Island, though its dimensions in no way entitle it to that term, except to distinguish it from its smaller portion.

The description given by Homer applies to this stone enclosure, quite as aptly as to that surrounding the agora at Mycenæ, and though its form differs, that at Avalon being oblong, that is I think easily explained.

All the dolmens in that part of Brittany are long chambers, and it appears to me, as the accounts are persistent that King Arthur, that is, a christian sovereign bearing that name, quite apart from the solar myth, was buried in the Isle of Avalon lying off this coast, that he was buried in a pre-existing dolmen, unless the antiquity of his associations or race entitled him to an ancient form of burial, but that in either case the old or the new construction would agree with those of the district, a long oblong, and that consequently the form of the peristalith was governed by what it

surrounded. Leake says the above oblong pyramid had been used as a sepulchre; if so, it must have been by appropriation.

No difficulty arises from the chamber intervening between the stones. The elevated portion of the rock, referred to by Dr. Schliemann as being in the centre of the agora at Mycenæ, which had however become reduced by falling, through his excavations, before I examined it, was, no doubt, surmounted by a stone rostrum, forming the *βῆμα*. But, whether it were so or not, the tomb at Avalon would act as such. And persons seated at the height of the surrounding stones. would not only be able to see and hear a speaker equally, but could also see and hear any of the sitting members in the agora or sacred precinct. Smaller stones could readily support the feet.

The presence of the great dead in the area of traffic or judgment, or, as Mr. Gladstone beautifully expresses it, when speaking of the agora, "a centre around which would cling the fondest moral and historical associations of the people," a precise representation of the Arthurian influence, was evidently intended to induce justice and fair dealing. Homer dwells on this expressively, two tablets of gold being the reward to the justest judge.

Chapman renders the description of the agora, in which he says "a solemn court of law was kept," and the reward given to the most just judge, as follows:—

> "The seniors then did bear
> The voiceful heralds's sceptres; sate within a sacred sphere,
> On polish'd stones; and gave by turns their sentence. In the court
> Two talents of gold were cast, for him that judg'd in justest sort."
>
> —"Iliad," xviii. 502 to 508.

Pausanias says of Mégara:—"Here they built the place for council, in order that they might have the tomb of the heroes within the place for council."

It requires an effort to stop while on this subject. There is absolutely no time to touch upon the Troad, within the period allotted to me. Nor, were I to do so, would it be suitable to the present audience, the ancient masonry at Hissarlik being of no defined order, but consisting, with exception of the tetragonal masonry shown in drawing, of stones with earth or mud between them, which Dr. Schliemann thinks was used in construction. The soil appears to me simply to have been forced into the interstices by the rain-wash of ages. Indeed, the next step, that of Hellenic masonry, I must not speak upon, for there are no examples beyond those quoted within the area my subject embraces. Did time permit, it would ease one's mind to say something of the overwhelming effects produced by such remains on Mount Ithomé, the City of Messene, Bassæ, and the prehistoric remains of Phigaleia, or to relieve the subject by descriptions of the Olympiad, or some of the sweet scenes on the banks and courses of the upper parts of the Alpheus.

I will not trouble you with antiquarian speculations, my business before a practical society must be practical, but one or two points of great interest have lately came before the public which claim attention, and I trust I may be permitted a few words on the practical features involved in them. The discoveries by Dr. Schliemann reveal to us one custom of which we had no previous knowledge. The covering the faces of deceased persons with golden masks, a custom we may be sure appertaining to regal persons, and perhaps to their highest officers, or if used more extensively, then made in an inferior material of which time has removed the traces. The great depth of the interments, together with the superstitious awe with which the cities of the Cyclopes were regarded, have saved the evidence of this interesting custom to the present time. The one from the ruthless invader, and military rifler of treasure sepulchres, the other from local and native plunderers. The custom exemplified by the masks, is perhaps the most complete evidence of the great antiquity of the interments, not only carrying us back to a date prior to the Persian war and the battle of Platæa, —sources lately suggested as those from which the gold ornaments may have originated—but also to

a custom clearly out of date even in the time of Homer, who, while describing the ceremonies of cremation and attendant rites, no doubt narrated them in accordance with customs existing in his time. But that to people craving after immortality and a resurrection, more strongly exemplified amongst the Egyptians than any other ancient nation, and with whom the occupiers of the Argolic district must have been in communication, the fact that no poetical mention of it is recorded, attests, even more strongly than the absence of inscriptions, the pre-poetic as well as pre-historic antiquity of the burials. For so powerful a theme as the proleptic irradiation of the countenance of the immortal and royal dead, would have been one not only on which a poet would descant, but of which, speaking to a people so predisposed, he would never satiate himself or his hearers. Should subsequent discovery show this to have been a custom in the countries whence the Medes or Assyrians issued it must necessarily even then be found to have been of very remote antiquity. It seems probable that the masks were spoils from Troy, that it was therefore an Asiatic custom, and probably went no further in Europe than their use by the "king of men" who had appropriated them.

Following almost immediately on this, arises the question of the sixth tomb, a discovery made by M. Stamataki of Athens (see letter *b* on plan); and the suggestion that this controverts Dr. Schliemann's argument in favour of these interments being those for which he searched. While on the one hand there is nothing to prove absolutely that the five tombs are those of Agamemnon and those buried with him, as mentioned by Pausanias, the argument that they are not those tombs lately transmitted from Greece, because the discovery of this sixth tomb disproves their being so, has much less weight. In the first place this tomb, while undoubtedly of the same date as the other five, can hardly be said to be within the sacred enclosure, it is quite as much without as within the circle of the agora, and the width of the stone seats almost covers it, while the five discovered by Dr. Schliemann are freely within the circle. Added to this is the well-known custom among all early warlike nations of depriving some near relative or grand officer of life, to make the solemnities of the interment more imposing and impressive, and yet we could hardly expect that such person would be so much honored as to have his name recorded side by side with the regal titles of the deceased monarch.

In the Discussion which followed the two Papers—

Professor LEWIS, Vice-President, said that Mr. Roger Smith had so thoroughly gone into his subject, bearing in mind the brief period available for the reading of a Paper, that there was not much to be said in the way of Discussion. The study of rude stone monuments, though not strictly architectural, was one that was capable of investing large portions of English and Welsh scenery with an interest over and above that due to natural beauty or romantic situation. The eye of the student of such remains would be able to read the landscape in a way that would be impossible to those who had paid no attention to the subject. What to ordinary observers were merely so much heather and heaps of sandstone had a story, however vague it might be, to tell to the student of ancient remains. On Dartmoor, for instance, were to be found remains of "beehive huts" and other indications of man's residence there at a very remote period, and amongst the Welsh hills, were to be seen the remains of some of the finest pieces of British fortification extant, and the surrounding hills were covered with Druidical remains of all kinds. As to the date of these remains, Palgrave, in his interesting work on "Arabia," had spoken of them, in a phrase which had now become almost idiomatic, as records of "the speechless past;" and as that was so, it was not possible to speak confidently as to their age. There was scarcely an inscription, however rude, to give the least clue to their age, or to the men who reared them. Where anything that could fairly be called inscriptions or carving were to be found, they were so imperfectly understood as to be of no

assistance to the inquirer. In Sardinia, in Wales, in whatever part of the world these remains were found, they were ever "speechless." Sometimes it was possible to obtain some information, if only of a negative kind, from a thorough examination of the site. A striking point in connexion with the subject was the singular resemblance or "family likeness" which such remains in all parts of the world bore to each other. That they must date from a very remote period indeed was proved by the utter desolateness of some of the lands in which they were found. Palgrave, in his work on "Arabia" before mentioned, said that in one place he came upon a circle of stones formed of trilithons so large as to remind him of Stonehenge, which they so strikingly resembled that it was difficult for him to realise that he was not on Salisbury Plain. Lieut. Welstead had also found many works in the neighbourhood of the Red Sea, which were curiously similar to those existing in Britain. It was certainly open to doubt whether some antiquaries were correct in their inclination to assign a comparatively modern origin to these remains. For his (the speaker's) own part, he was inclined to think they were incorrect. As to the uses to which these masses of stone were devoted, he thought there was no doubt that numbers of them, such as L'Ancresse, in Guernsey, were of sepulchral origin; but in others, such as Kit's Coty House, in Kent, he did not see how that could possibly have been the case: it might perhaps have been an altar or a *bema*. With reference to Dr. Phené's Paper on Mycenæ, it was many years since he (the speaker) was at Mycenæ; but no place he had ever visited had been more interesting. Ever since his visit, he had for years prior to Dr. Schliemann's splendid discoveries, suggested to his students in the course of his lectures, that if they ever had the opportunity to go exploring, the place where they might hope to be successful was Mycenæ, from the fact that the remains were known to have been left untouched, and that whatever was buried in the ruins of the Treasury of Atreus would probably be found there still. This had proved to be the case, just as the Germans had found such priceless treasures at Olympia. With respect to the theory of Dr. Forchhammer, he concurred with Dr. Phené.

After some observations from Mr. J. T. Wood, Hon. Fellow, and other Members,

Mr. R. Phené Spiers, Fellow, said that thanks were specially due to Sir Henry Dryden, Bart., and to Mr. William Simpson, the well-known artist and newspaper correspondent, for their kindness in sending the drawings exhibited on the walls.

Mr. T. Roger Smith expressed his gratification at the amount of discussion the subject had received. Professor Lewis, in his interesting speech, had entered upon the vexed question of the date of these remains, and Dr. Phené and other speakers had touched upon the question as to how far the stones in such monuments had been artificially shaped, and how far they owed their appearance and contour to the hand of Nature. The latter was a point as to which he found it very difficult to come to a conclusion, even in sight of the remains themselves. In reply to Mr. Wood's question, his (Mr. Smith's) opinion was that the depressions which he noticed as existing in a considerable number of mounds or cairns in the neighbourhood of Penmaenmawr could hardly have been caused merely by the rifling or spoliation of the mounds, for the bottoms of the depressions were very evenly formed, the indentations being saucer-like in form, and so extremely sharp and clear in their outline that they hardly appeared to have been touched since the day they were formed. The idea had suggested itself to him in the presence of the cairns themselves that these depressions might have been used as places in which to light fires for funeral pyres, beacons, or other purposes. With regard to menhirs, the point raised by Dr. Phené was a most interesting one, and he hoped the Architectural Association would ask that gentleman to read a paper on those prehistoric remains, as the idea as to their being beacons was one very well worth full enquiry.

A brief reply from Dr. Phené concluded the proceedings.

Royal Institute of British Architects.

INCORPORATED IN THE SEVENTH YEAR OF WILLIAM IV.

THE TRANSACTIONS.

SESSION 1878-79.

USUI CIVIUM, DECORI URBIUM.

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Royal Institute of British Architects.

INCORPORATED IN THE SEVENTH YEAR OF WILLIAM IV.

SESSION 1878-79.

I. THE OPENING ADDRESS. By Charles Barry, F.S.A., *President.*

My Dear Friends and Colleagues,—For the third and last time it has become my duty and privilege as your President to welcome you to the commencement of another Session of professional intercourse, no less pleasing to us all personally than useful, as I hope, in furthering the very worthy objects for which we are corporately united. At the same time, having in my two former Annual Addresses dealt with very many of the subjects of prominent interest to professional men, whether as artists or as men of business, I feel some difficulty in now offering to you observations sufficiently worthy of your regard. Not indeed from any lack of matters of deep interest to us all, which are continually, year by year, coming forward and claiming notice, but in consequence of my want of sufficient time to consider them all as they deserve, no less than from lack of sufficient ability to deal with them exhaustively, and to deduce from their consideration all the advantage which they might perhaps be made to render to us.

However, knowing that I may count on your indulgence and consideration I will address myself as best I may to the task that lies before me; and perhaps I cannot do better, after placing before you, as is customary, some memoranda of a statistical nature connected with the Institute—and after asking you to remember with me the friends who have passed away from among us since this season last year—to take a review of the comparative position of the Institute in 1876, when you first called me to this chair, and its position at the present time; in other words, to render an account of my stewardship.

With regard to the number of our members I was able, in my Address of 1876, to point to a considerable increase in the year then last past—an increase beyond the average of preceding years. I am now able, starting from the vantage ground of 1876, the year of our reforms, to announce a considerable further growth.

Taking first for examination the class of our strictly professional members—far from diminishing, they have increased during the above two years from 614 to 643, and as within that period 17 have died, the real increase is 46, or about 8 per cent. When we add to these the classes of our non-professional members (and notwithstanding the abolition of the class of Contributing Visitors), we find that the total number of subscribing members in 1876 was 623, while at the present time it is 720, an increase of 97, or about 16 per cent.; and these figures are exclusive of our Honorary Fellows and Honorary Members.

Once more, when we compare the roll of our non-metropolitan members then and now, we meet with no less gratifying results. Some few—very few—have left us since the subscription was raised, but taking those who are with us still and including those who have presented themselves for election since, all of whom willingly pay the full subscription, we find this result. In 1876 we had 272 non-metropolitan members, in the interval 6 have died, and we have now 290, showing therefore an actual increase of 24, or 9 per cent., in that class of members only. That a much larger addition to our numbers may take place I sincerely hope, and, without being too sanguine, I think may fully be expected.

I congratulate our members also on the satisfactory state of our finances. Some among us feared, I know, that in carrying out the changes of the last two years our funds would suffer much fluctuation and possibly ultimate loss. It is not so—as a few figures will make abundantly evident to you. In 1876 our income (exclusive of all trust monies) was about £1720., while in 1878 it is about £2070., shewing up to the present time an increase of *annual income* of about £350.; and this sum does not include the entrance donations of our Honorary Associates. I may further mention that our invested capital at the present time (exclusive of the trust investments) is £5650.; and I name this, in reference to the expenditure which may be temporarily necessary for our better accommodation, pending the gradual, but I hope certain, increase of subscriptions for these purposes, when the money so taken can be gradually repaid; and after which our investments will, I hope, soon considerably exceed their present amount.

THE LIBRARY.

During the two years, from 1876 to 1878, our already valuable library has largely increased—more than 500 volumes, exclusive of periodicals, having been purchased or presented to us. This has been greatly due to the augmentation of the purchasing fund from the entrance donations of our Honorary Associates, but, even independently of that, we have a good store of cash in hand. The fund in 1876 being £89., whereas, notwithstanding the expenditure on books of £85. in the past year, it is now £156.—the money donations now being nearly four times their amount in 1876, for in that year they were £53., and in the present year £198. You will remember that one of the changes made by you on the suggestion of the Improvement Committee, was to open the library in the evenings as well as by day; the result is shewn when I mention that, in 1876, 268 readers in all made use of our collection, whereas in the past year we find no less than 596, nearly equally divided between day and evening students. Gratifying as this is, I do not yet think the enormous and varied fund of professional information we possess is used as fully as might be by our members, especially by our younger members. As you are aware, the Council are doing all in their power to afford, at a nominal charge, facilities of access by special reading tickets which are given to students in the offices of our own members—to members of the Architectural Association, and to the pupils of the Architectural Classes at King's College and the University of London. Many presentations of valuable books have been made, both by our professional members and by our Honorary Associates, while we are also indebted to several of our Honorary and Corresponding members—at Berlin (Professor Gropius), at Amsterdam (Messrs. Cuypers), at Copenhagen (Professor Meldahl), and at Paris (M. Vaudremer), for special donations illustrative of works in their several cities; and last, not least, we are to be possessed of a valuable collection of books presented by our late friend, Mr. Nelson, and consisting of upwards of 200 volumes, many of them of much value.

Let me (at the risk of seeming importunate) again appeal to our members to add, whenever they can do so, to our lately-started collection of drawings of those old buildings which may have been entrusted to them for restoration; and while I ask you to thank Messrs. Carpenter, Tarver, Withers and others, who have sent us contributions to this collection, I again ask in your name for similar favours at the hands of many of our members, who undoubtedly must be able to enrich our store. Our new members, for instance, the two sons of the late Sir G. Gilbert Scott, will doubtless find it in their power to aid us in this respect when they have had time fully to examine the numberless drawings which their late father, from his special practice as a restorer, must have left behind him. And there are, of course, many others of our living members who notably have had and are having great opportunities in the same direction. One of our members has kindly presented to us a very interesting

series of engravings of our old City churches, and any addition to this series will be very gladly received, especially when we remember that under the action of the "Union of Benefices Act," and in consequence of the large metropolitan improvements now in progress and likely to be undertaken, many of this class of buildings will ere long disappear.

I have also again to appeal to those of you who may happen to have duplicate copies of professional works to remember our "Lending Library." Although as yet of modest extent, it has been found most useful, and there can be no doubt that, with its growth, will increase the demands made upon it.

THE PREMISES OF THE INSTITUTE.

We find ourselves still in our accustomed rooms, though the Council feel with you that they are no longer suitable or spacious enough for our increasing needs. Much care and thought has been given to the subject by the Council since we last met. I will not anticipate the special report which will be shortly laid before you, further than to express my personal hope that, whether we remain here or find a new home elsewhere, the general body of members will take a broad and comprehensive view of the matter, not contenting themselves with small treatment of the matter, which would lead to present waste of money and ere long need to be re-considered, but will look rather to the Institute of the near Future,—as it ought to be,—as it may be,—and, with united action on the part of all, as it will be. It may, perhaps, be our wisest course for the present to content ourselves with temporary expedients for our greater comfort, at least until we feel ourselves in a position to obtain a really permanent home for the Institute of sufficient size and sufficient dignity to deserve that name.

Obituary of the Year 1877-78.

The record of departed friends—members of our body—will naturally commence with one of Sir George Gilbert Scott, whose unexpected loss is still fresh in our recollection, and in full appeal to our feelings. The impressive manner, however, in which the Institute manifested its regard for and appreciation of Sir Gilbert, at the time of his death and funeral, renders it quite unnecessary to say what I should otherwise have desired to do on behalf of his colleagues here. They have made their witness heard already. Some few particulars, however, of Sir Gilbert's life and career should find record in this Address, since it has only been as yet recorded in the passing literature of the press.

SIR GEORGE GILBERT SCOTT, R.A., *Ex-President (Royal Gold Medallist)*,

Was born in 1811 at Gawcott, near Buckingham, his father being vicar of that parish. He was the grandson of that Rev. Thomas Scott, whose Commentary on the Scriptures was at its publication at once recognised as a text book, and is still regarded as a treasury by theologians. It may not therefore be extravagant to suppose that the future great Church Architect had some congenial fitness for the task of restoration of ecclesiastical architecture, with which his name and fame will always be identified. To give a full catalogue of Sir Gilbert's works is not in my power, but one of his earliest works was a church at Lean Side, Nottingham, designed in what was then known as the Early English Gothic style. In 1841 he designed the Martyrs' Memorial at Oxford, which was at once and is still deservedly admired. The Church of St. Giles, Camberwell, soon followed, at which period Mr. Moffatt was for a short time Mr. Scott's partner.

St. Nicholas, Hamburgh, having been destroyed by fire in 1842, a competition for the new church was instituted, open to all the architects of Europe. Mr. Scott's design was considered the best, and he received the appointment of architect for the new building. This has only been lately completed, and is considered one of the finest modern churches on the Continent. In 1847 he was engaged on the churches of St. Matthew, City Road, and St. Philip at Leeds; and the next year he furnished a design for the Cathedral of St. John's, Newfoundland, which I believe has been recently consecrated. His first literary production appeared in 1850, under the title of "A Plea for the Faithful Restoration of our Ancient Churches," and was followed by several others.

He was successful in 1855 in the important competition for the new Hôtel de Ville and Senate House at Hamburg, but the design has not yet been carried into execution. Appointed architect to the Dean and Chapter of Westminster in 1849, he at once threw into his labours there all that earnest love combined with reverence for the work which gave such a charm to his character. He carried out various works in the Abbey, including the entire re-arrangement of the choir, besides restoring the Chapter House to its pristine beauty. He also designed the pile of houses in the Broad Sanctuary, with the important central archway to Dean's Yard; later on, his characteristic design in memory of the Westminster school boys, who fell as officers and soldiers in the Crimean war, has given further architectural interest to this locality. The cathedrals of Ely, Lichfield, Hereford, Ripon, Gloucester, Chester, St. Davids, St. Asaph, Bangor, Salisbury, Exeter, Peterborough, Worcester, Rochester, Oxford, Durham and Chichester, all have passed under his hands, and will bear for ever the impress of his genius. The new Church of St. George at Doncaster, finished in 1858, was designed by him in 1853, in place of one destroyed by fire; and of about the same period are his designs for Kelham Hall, near Newark, and the Chapel, Library and Lodge at Exeter College, Oxford. Though only third in the list of the competitors of all nations who sent in designs for the proposed concentration of new Government offices in Westminster, for which, in 1856, an international competition of architects was invited by the Government, Sir Gilbert had the good fortune, under somewhat exceptional circumstances, to obtain the appointment of Architect to the New Foreign Office. The building, however, designed by him as a condition of his employment in an unfamiliar style, though one deemed by the then authorities, and by many of the public, the most fitting for public offices, has not been so generally approved as his great ecclesiastical works in Gothic Architecture. The Home and Colonial Offices, having been designed as part of the same block, have since been carried out under his charge. Among his late works may be cited St. Peter's Church, Croydon; the Town Hall at Preston; the Infirmary and Beckett's Bank in Leeds; the College Buildings, Glasgow; and the Midland Hotel and Terminus at St. Pancras. In 1863, Sir Gilbert, then Mr. Scott, was asked with five other architects to submit a design for the then projected Albert Memorial, proposed as a national expression of the sense by the whole nation of the loss which had been sustained by the early death of the late Prince Consort, and he was so fortunate as to be chosen by the Queen to carry his design into effect. Of its architectural merits or shortcomings I do not think it well here to speak, for, naturally, opinions greatly differ, but it must always remain one of the most important, and, for its magnitude, one of the most costly structures in London. As a mark of the Queen's satisfaction at this result of Mr. Scott's labour, Her Majesty conferred on him the honour of knighthood. A new cathedral for the city of Edinburgh, the restoration of St. Alban's Abbey, and St. Margaret's, Westminster, and many other works, were in hand at the time of his death; and having regard to the "burning question," whether the nave roof of St. Alban's should be replaced by one of a different character to that with which we have been familiar for 400 years, we may wish we could hear the real feeling of our lost friend from his own lips—

inasmuch as his authority has been cited as agreeing with both sides of the controversy. He was elected an Associate of the Royal Academy in 1855, and an Academician in 1860. He died suddenly March 27th, 1878, aged 67.

Two sons of Sir Gilbert follow their father's profession, and have been already engaged in works of sufficient importance to enable us to judge of their distinctive feeling as architects. They are both recommended for Membership of this Institute, and we may hope often to see them among us, and to have to congratulate them on professional successes from time to time.*

SYDNEY SMIRKE, R.A., *Past Vice-President (Royal Gold Medallist).*

Mr. Sydney Smirke, was the fifth son of Robert Smirke, R.A., the well known painter and illustrator of "Don Quixote;" he was a younger brother of the late Sir Robert Smirke, R.A., in whose office he received his professional education, and whom he succeeded in many of his appointments. After three years of Continental travel he in 1834 commenced active practice, and, as Architect to the Commissioners of Customs, built the Custom Houses of Bristol, Gloucester, and Newcastle. Among his earliest works was the Oxford and Cambridge Club House, Pall Mall, in which his brother was associated with him; as well as at Lichfield Cathedral and York Minster. He also erected the Conservative Club, St. James's Street, in conjunction with Mr. George Basevi, and the Carlton Club, Pall Mall, which took the place of a modern edifice erected by his brother in 1834. He was awarded the third premium in the competition for the Royal Exchange, and his graceful design for the Nelson Monument received high commendation. The restoration of the Temple Church, in 1842, was carried out by him jointly with Mr. Burton. He erected for the Inner Temple several blocks of chambers, and in 1870 completed the new Dining Hall for that Society. At the British Museum he completed his brother's design for the main building; finishing the portico, courtyard, and erecting the inclosure railings. He added the Lycian and Assyrian Galleries, and the noble Reading Room which occupies the former quadrangle and which under its vast cupola affords excellent accommodation for readers. The arcades round theu pper gardens of the Royal Horticultural Society, South Kensington, were designed by him. He enjoyed an extensive private practice, and his last work was the block of buildings for the Royal Academy at Burlington House, comprising the admirable exhibition rooms and galleries. In 1817 he gained the silver medal of the Royal Academy, in 1819 the gold medal, and in 1862 the gold medal of the Royal Institute of British Architects was awarded to him by the Queen on our recommendation. Elected Associate of the Royal Academy in 1848, and Royal Academician in 1860, he became treasurer of that body; and in 1861 was nominated Professor of Architecture. His lectures delivered in that capacity have not been published separately, but they will be found in the professional journals of 1862 and subsequent years. As a Fellow of the Society of Antiquaries his contributions to the "Archæologia" were of much interest, and the Papers read by him before this Institute were highly appreciated. In 1834 he published an essay entitled, "Suggestions for the Improvement of the Western Part of London;" and he frequently made valuable communications to the public press. His kind and considerate feeling led him to assist in the most earnest manner in the foundation of the Architects' Benevolent Society, over which for many years he exercised a watchful and beneficent care, while as one of the

* Sir Gilbert Scott's contributions to the TRANSACTIONS comprise:—Letter respecting Chesterfield Spire (MS.) 5th Feb. 1855; Letter in reply to "Some Remarks," by W. Tite (MS.) 11th Feb. 1856; Gleanings from Westminster Abbey, 5th and 19th Dec. 1859; Conservation of Ancient Monuments and Remains, 6th Jan. 1862; On Westminster Abbey, 12th June, 1872; Opening Address, 3rd Nov. 1873; Opening Address, 2nd Nov. 1874; Opening Address, 1st Nov. 1875.

original members of the Architectural Publication Society and, of late years, its treasurer, he materially assisted its work. He had retired from the active duties of his profession some years before his death, which took place at his residence, Tunbridge Wells, on the 11th December, 1877, in the 78th year of his age.*

ALBERT J. HUMBERT, *Fellow*,

Died on the 24th December, 1877, at Castle Mona, Douglas, Isle of Man, in the 56th year of his age. He commenced his professional career in partnership with Mr. Reeks (of the Office of Works) with whom he had spent as an architectural student some time in Italy. In 1853 Bodiham Church, Sussex, was rebuilt from their designs. He was one of those who submitted designs which attracted attention in the Public Offices Competition of 1856. The chancel of Whippingham Church, in the Isle of Wight, was rebuilt under his direction, and in 1860 the rest of the church was rebuilt from his designs. This work having attracted the attention and approval of the Queen, he was employed on the mausoleum of the late Duchess of Kent at Frogmore, near Windsor, executed in 1860 ; and after the decease of the late Prince Consort he was again employed at the instance of Her Majesty to design and carry out the well-known Albert mausoleum at Frogmore, wherein Prof. Ludwig Grüner was associated with him to design the elaborate internal arabesques. Sandringham House was also completely rebuilt from his designs for the Prince of Wales ; the rebuilding, commenced in the summer of 1868, was finished during the autumn of 1870.

HENRY BAKER, *Fellow.*

Mr. Baker has been called in point of official age the father of the District Surveyors. As District Surveyor he acted for many years for the parish of S. Pancras. He was educated for his future profession in the office of Mr. Samuel Ware, who was then surveyor to the Duke of Portland's extensive and valuable estates in Marylebone, and on his decease, in 1864, Mr. Baker was chosen to fill the same position, and did so until his death. Among his works may be mentioned the buildings called the "Corner," identified among city men for many years as the office of Messrs. Overend, Gurney and Co. ; the English, Scottish and Australian Chartered Bank in Cornhill ; the London and Westminster Bank in High Holborn (the result of a successful competition) ; St. Pancras Almshouses at Maitland Park, Haverstock Hill ; Messrs. Spalding and Hodge's Paper Warehouse, Drury Lane ; the Chancel of Wargrave Church, &c. He was for many years on the Council of the Art Union of London, and was much respected for his amiable qualities by all who knew him. He died in London on the 28th of April, 1877, in the 75th year of his age, and was interred in Highgate Cemetery.

MATTHEW THOMPSON, *Fellow*,

Commenced his career in the office of Messrs. Scott and Moffatt ; he was also for some time after their dissolution of partnership, manager to the late Sir Gilbert Scott. He gained, at the outset of his career, both the first and second premiums for an extensive hospital near Durham. He was for many years a member of the Town Council of Newcastle, and was more than once President of the

* Mr. Sydney Smirke's contributions to the TRANSACTIONS are :—Letter on some peculiarities in the Architecture represented in the bas-reliefs recently brought from Nimrod (MS.) 28th June, 1847; Account of the Contents of a Work by Sir B. Gerbier, written in the 17th century, and entitled, "Counsel and Advice to Builders," together with some remarks (MS.) 19th March, 1849; Style of Ornamentation prevalent in the Assyrian sculpture recently discovered, and on some peculiarities of Architecture as exhibited therein, 18th March, 1850 ; Technical observations on the Architecture of the Honey-bee, 13th June, 1853 ; Water Supply to Towns, 22nd Feb. 1858 ; Recollections of Sicily, 5th Nov. 1860 ; Account of the professional life and character of the late Professor C. R. Cockerell, R.A., late President R.I.B.A., 16th Nov. 1863.

Northern Architectural Association. He was appointed some fifteen or twenty years ago by the Duke of Northumberland architect to his Grace's estates in Northumberland, and in consequence designed and carried out a large number of buildings in the north of England. Among his works are churches at Morpeth, Gamesley, Birtley, Alnmouth and more than one in Newcastle. He was architect also for large mansions at Dipton, Stagshaw, Grinkle Park (Mr. C. H. Palmer, M.P.); also for Workhouses at Houghton-le-Spring and Chester-le-Street. He died in May, 1878, after a long and useful career.

WILLIAM FOGERTY, *Fellow.*

Mr. Fogerty, who was a native of Limerick, died at his residence in Harcourt Street, Dublin, on May 22nd, 1878, at the early age of 44, from small-pox. He had resided and practised his profession for some years in London. He visited the United States about five years ago, and contributed a series of interesting articles to a professional newspaper on the state of architecture there. He erected an Episcopalian church in New York. On his return he settled again in Dublin, and the following are some of the buildings erected by him:—The Protestant Hall, Limerick; a large mansion for Mr. Phelps at Castle Connell; Mr. Rivington's house at Ardagh; the Munster Arcade, Cork; the Lunatic Asylum, Ennis; the Wesleyan College, Belfast; Violet Hall House, Bray. Mr. Fogerty was the architect for the Smith O'Brien mausoleum, and designed after the ancient Irish model the cross erected by the late Archdeacon Goold. Mr. Fogerty was an old member and ex-President of the Royal Institute of Architects in Dublin.

CHARLES CHALLONER OGLE, *Associate.*

Mr. C. C. Ogle, who was barbarously murdered in Greece early this year, aged only 27, while acting as *Times* correspondent, was a man of varied attainments; he however started in life intending to devote himself exclusively to the profession of an Architect. He was articled to Mr. F. W. Roper. In 1873 he became an Associate, and proceeded to visit Italy and Rome. He went to Athens in 1875, and then associated himself with Herr Ziller, the Royal Architect, as assistant in his office. While thus engaged he sent several very interesting communications to the *Builder*, among others may be cited "Athens To-day," and "Modern Athens." He had, about the same date, addressed a letter to the *Times* and being encouraged by its favourable reception to write again, he ultimately became one of the recognized correspondents of that journal, and leaving his architectural studies devoted his time and talents to duties in the discharge of which he met his sad and early death. He was followed to the tomb by all the ministers of Greece, the King himself being specially represented, and by an immense crowd of friends made by him in the country of his adoption.

HARTLEY WILLIAM BURGESS, *Associate,*

Was a native of Jersey; he became an articled pupil of the late Mr. W. Brown, of Reading, and afterwards entered the office of Messrs. Whichcord and Son, at Maidstone. For the last twenty years he had been connected with the office of Mr. John Whichcord, F.S.A., having the management of his business as District Surveyor for Deptford. For some years past he also practised independently as an architect, and carried out several very creditable buildings on his own account. Many kindnesses received at his hands by younger members of the profession will now be mournfully remembered by them. He died on the 13th of January, 1878, in the 52nd year of his age, from the consequences of an accident at the Greenwich Railway Station.

CHARLES ROWE DILLON, *Associate.*

This gentleman's name is on the list of those lost to us this year. He and his wife were on board the ill-fated "Princess Alice" steamer, at the time of the recent catastrophe. Mr. Dillon was originally articled to Mr. Elmes, the architect of St. George's Hall, Liverpool, and on the death of that gentleman he was transferred to another architect since dead. At the expiration of his articles, he entered the office of Mr. Philip Hardwick, F.S.A., whom he left in order to accept an appointment at the South Kensington Museum, where his professional education, good practical skill, and steady plodding industry, made him most valuable. Though, besides his work there, he carried on private practice, he has not executed any building of public interest.

CHARLES CHARNOCK NELSON, F.S.A., *Past Vice-President.*

On the mournful roll of our losses is one whose name for many years was a household word here—one whose genial manner and courteous bearing to all connected with the Institute, or interested in its well-being, was proverbial. Indeed, our lost friend and comrade, Mr. C. C. Nelson, seemed to deem this Institute as almost his first care in life, and in death he has not changed, for as he was through life always a munificent donor to our library, he has now bequeathed his valuable collection of architectural books to the Institute. Fortunately for his peace of mind, Mr. Nelson had sufficient means to render great toil in professional practice unnecessary, and he thus had leisure to pursue his literary studies relating to our art with calmness and pleasure; and I can testify, from personal experience, that even in the latest years of his life, which, alas! were years of much suffering, he was kindly and keenly alive to all our doings, our hopes and efforts, and expressed to me (as I am glad now to remember) his full and entire sympathy with all our proceedings since I became so deeply responsible to you—for so I must ever feel—as to have been your President during years of change.

Mr. Nelson was a pupil of Sir Robert Smirke, R.A., and of Mr. Nicholson, with whom he was placed in 1825. Then he spent some time in travelling through Italy and Greece, and was, I believe, resident in Rome about 1834. He joined the Institute in 1843, introduced to it by Professor Donaldson; became a Fellow in 1847; Member of Council in 1848; and, from 1850 to 1861, he undertook the trying and unremunerated duties of Secretary, in company with Mr. J. J. Scoles, and afterwards with Sir M. Digby Wyatt and our good friend Professor Hayter Lewis, revising and condensing the Sessional papers for publication with unusual judgment and tact. Elected again on the Council in 1863, he resigned the General Secretaryship, but undertook the duties of Honorary Secretary for Foreign Correspondence, and being an excellent German, French, and Italian scholar, filled that office most ably. In 1864 he became a Vice-President, and, when his term of office in that capacity expired, he still continued on the Council till 1867, when he retired from active professional life. Some years later he was a constant sufferer from the complaint which has now ended only by his death.

He was one of the acting Committee of the Architectural Publication Society's Dictionary, and in its revision for the press I am told by his fellow-labourers that his services were invaluable, extending over the whole range of that great work from letters A to P. He was also a director of the Architectural Union Company, commended as that Company was to him by its first object—that object being to find a better dwelling place for the Institute, in which he felt so true an interest, than it then had. He was also a Fellow of the Society of Antiquaries.

Zealous, hard-working, with cultured mind and refined taste, Mr. Nelson was one of those men

whose quiet, unobtrusive work avoids special public notice, but, none the less deeply appreciated by his friends and colleagues during life, is remembered with deep regret when no longer at their command.*

FREDERICK PEPYS COCKERELL, *Honorary Secretary.*

The vacant chair beside me will cause an ache to many a heart here when, with me, they remember the late kindly genial occupant—the man of extensive knowledge and refined taste—the sincere friend of all who had the privilege to call him by that name. At the early age of 45, our colleague, Frederick Pepys Cockerell, has been taken from us, and from the affection of those near and dear to him, with whom he might surely without presumption have hoped to pass a long life, and into whose feelings of deepest sorrow I dare not enter. Professionally, Mr. Cockerell has done more than enough to add honour to the name he bore, and though he has not been the author of many public works, yet a large number of the residences of our nobility and gentry remain as evidence of a taste and power that, had he lived to ripe age, would have doubtless proved to be only the forecast of greater and more important works. It will be difficult indeed for the Council to suggest a name to you of one who can as worthily as our lost friend fulfil the functions of Secretary for our Foreign Correspondence. When so suddenly cut off he was in Paris, in the company of, and receiving honoured welcome from, his professional colleagues there, especially from our distinguished member, M. Duc, between whom and Mr. Cockerell the warmest feelings of esteem and friendship existed. Although I had known him for many years, indeed, since we were boys, for his father and mine were intimate friends, I had not learned to know him fully and esteem him as he deserved till constant official intercourse with him during my Presidency brought us frequently into intimate contact; and the remembrance of this, while it enables me to honour his memory, as was his due, makes more keen the shock of knowing that we are to see him amongst us no more.†

Among our Foreign Members, we have lost three men of some importance :—

CHARLES CÉSAR BENVIGNAT, *Hon. and Corr. Member,*

Was a native of Lille, born in 1806, and from his early years shewed unmistakeable evidence of the bent of a very earnest mind coupled with talents of no mean order. In 1821, at the early age of fifteen, he carried off the first prize to students for architecture at the Lille Academy, and in 1824 joined the École des Beaux Arts in Paris, where medal after medal recompensed his earnest study; after travelling in Italy, and debating for a time whether he would be a painter or an architect, he decided to make the latter the business of his life. In 1833 we find him appointed Professor of Architecture at the Academy of Lille, which had become proud of him as a distinguished student; and from 1842 a series of very important works in his native city was executed from his designs and under his care. Among them I may mention the Restoration of the Great Theatre, the Bourse, the City Markets, the Hôtel de Ville, the City School, and the College of Medicine, besides several churches and private houses, all of which were carried out by him between 1842 and 1854. In the midst of all these purely architectural works, M. Benvignat, true to his early love for painting no less than architecture, found time to produce many portraits of his friends, shewing considerable talent,

* Mr. Nelson's contributions to the TRANSACTIONS comprise:—Description of the Antiquities of Pola in Istria, illustrated by original drawings made, 1844 and 1850, by A. Glennie, 7th April, 1851; W. Salzenberg's "Early Christian Monuments of Constantinople from the Vth to XIIth Century," 5th Feb. 1855; Leo von Klenze: Necrology, 14th March, 1864; Information forwarded from abroad (on foreign improvements), 9th Jan. 1865; Biographical Notice of F. J. Fischer, 20th Jan. 1865.

† Mr. Cockerell's contributions are :—Architectural Accessories of Modern Sculpture, 22nd April, 1861; Biographical Notices of Deceased Foreign Members, 27th March, 1876. A Memoir of the late Hon. Secretary, with an account of his works, will be shortly published in the TRANSACTIONS.

and even to design and paint important pictures illustrative of the History of Lille and its sieges, some of them of sufficient merit to gain places in the Paris "Salon." He was a Member of the Board for Civil Buildings in Lille from 1842, also Member of the Commission of Fine Arts there, and at the time of his death filled the important post of President of the Imperial Society of Arts and Sciences at Lille. He has passed away amid the praises and regrets of his fellow citizens, who proudly number him as one of their most distinguished children of recent times.

GIUSEPPE MENGONI, *Hon. and Corr. Member*,

Was killed during his attendance at his great work, the Galleria de Vittorio Emmanuele, at Milan, from the consequences of a fall from a scaffold. He was, I believe, a native of that city, and at his death only in middle age, full of promise and energy. Extensive improvements having been suggested in the centre of the City of Milan, especially with reference to a desired connection between the Piazza del Duomo and the Piazza Scala, plans were invited from all Italian architects for the reorganisation of this entire quarter. The project presented by Signor Mengoni shewed such evident talent and breadth of conception that it most deservedly gained the first place, and its author, then a young and unknown man, emerged at once into the notice his talents merited, and had his life been spared, I cannot doubt that other important works would have extended his reputation. When his plan was adopted by the City of Milan, it became necessary to seek for far larger funds than those at command. These were supplied by the English Credit Foncier then in active operation, under guarantees for interest and repayment in a term of years by the Municipality of Milan. The plans and designs of Signor Mengoni were referred by that company to me to examine, independently of course of questions of financial success, though that seemed at the time also certain from such information as came to my knowledge. Unhappily, however, the large promises of companies of this sort of enormous dividends to their subscribers, before they were actually earned by the completion of their enterprises, were ere long found to be delusive; money failed, and the works at Milan were suspended, after about one-third only of the project was carried out, of which the "Galleria" was to form only one item, and they have, I think, still remained so. During its progress I was associated with Signor Mengoni by the Credit Foncier, as consulting architect, and as such had frequent opportunities of becoming intimately acquainted with him and of seeing how real a love he had for his art; entering, not only into bold conceptions of design, but carefully identifying himself with every detail. He spared no time or labour to perfect this work, rightly imagining that its completion and success would be his passport to that European fame, of which (with great personal modesty) he was above all things ambitious. My regret at the loss architecture has sustained by his untimely death is mixed to no small degree with sorrow for that of a personal friend, whose warmth of feeling and great devotion to our art had naturally gained my high esteem. Last on my list is

ENRICO ALVINO, *Hon. and Corr. Member* (Naples).

Important Events during the Year 1877-78.

THE PARIS EXPOSITION.

Organized on a far larger scale, and with more completeness, than any former exhibitions, Architecture found of course its due place at the Paris Exposition, and we shall all remember with pleasure the gracious letter of the Prince of Wales, as President of the British section

in that Exposition, asking the members of this Institute to aid him in the great work he had undertaken, so far as Architecture was concerned, and the high compliment he paid the Institute by nominating their President (for the time being) a member of the Royal Commission. I need not tell you with what anxiety I undertook, in your name, the important duties of this office. I was powerfully aided by a Committee appointed by the Council, consisting of influential and distinguished members of the profession, so selected that on it should be found representatives of every school of architectural taste and thought among us. On the announcement by me to my brother Royal Commissioners in the section of Fine Arts, who were charged generally with the arrangements for Painting, Sculpture, Architecture and Engraving, of the appointment of this Committee, they at once agreed to leave the whole arrangement of collection and selection of the representative *architectural works* which were to be sent to Paris to them. How well they discharged their duty will be evident when I tell you that 171 works by 64 different exhibitors were presented by our Committee to the Fine Arts section and forwarded by them to Paris; and that, had space been at our disposal, this number could easily have been doubled. Mainly by the personal exertions of His Royal Highness additional space was obtained for the British Fine Art exhibit as a whole—in which extra space architecture shared to a moderate extent—consequently all these works so sent were enabled to be exhibited. That they were well and carefully exhibited on the rather limited space after all at disposal is due to the care and energy of our member Mr. Roger Smith, who kindly undertook the difficult and delicate task of arranging and hanging them, and did his work as far as I have heard to the general satisfaction of the exhibitors. An international jury consisting of ten members whose names will be found in the note below,* was then appointed by the Superior Commission in France. Of these five were distinguished French architects, who are Honorary and Corresponding Members of this Institute, and by all I was welcomed with the utmost cordiality; each of the following nations were represented by one member of jury to each, viz.: Austria, Italy, the Low Countries, Egypt and England. I had the honour of representing England on this occasion. The duties to be discharged by this Jury were very laborious and demanded no little judgment and tact, and it will be interesting to our members to learn that more than a fortnight was devoted to carefully inspecting and considering each one of the very numerous works sent in by all nations, amounting in all to no less than 863 drawings, sent by 19 different nations. A preliminary examination took place, with the object of distinguishing those works which were of sufficient merit to require further and closer examination, and in passing through this ordeal, the English exhibit consisting in all of 171 works, by 64 authors, had 126 works by 44 authors reserved for such further consideration—a considerably larger proportion than was obtained by the exibits of any other country—including even the French division itself. It will be remembered that having in view the small space available for the British Architectural Exhibition, our Committee confined their selection rigidly to works *actually* executed within the last ten years, or still in process of execution. On the other hand the French Architects

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* Names and countries of the jury:—

FRANCE.	M. Ballu.	AUSTRIA.	Herr Ferstel.
	„ Bœswillwald.	BELGIUM.	Mons. de Stuers.
	„ Duc.	EGYPT.	Mariette Bey.
	„ Lefuel.	ENGLAND.	Mr. Charles Barry.
	„ Vaudremer.	ITALY.	Commander Basile of Palermo.

From whom—Herr Ferstel was nominated President by the French Superior Commission.
Mons. Lefuel, Vice-President.
Mons. Vaudremer, Secretary and Reporter. } Chosen by the other members of the jury itself.

having at their disposal about six times the space allotted to us, did not so confine themselves, but out of the 369 works sent by them, only 183 represented works executed or in progress—a contribution very little in fact more numerous than our own—while the exhibitors were not even as many as in our case.

It was a matter of regret to me that many English architects were inadequately represented or not at all, and that the known extensive and important architectural works going on in our various Colonies were also practically unrepresented. In answer to my enquiries on this head of the Colonial Commissioners, I could only obtain 21 drawings sent in by 4 exhibitors as representing the Colonial architecture of Great Britain to submit to the judgment of the jury.

The final Report of the jury has now been made public, and you will note with pardonable pride that, in the award of prizes, English architects have been adjudged a larger number than any other country, except France, the number of whose exhibits (many of rare excellence) amounted to nearly half of the total number sent by all other nations combined. I see that a writer in one of our professional journals, when the names of the English recipients of prizes for Architecture was informally made known some time ago, was so good and so ingenious as to suggest or concoct a supposed system he thought was probably adopted by the jury in making the awards. Whether such a mode of making the awards would have commended itself to the judgment of the jury, had it been suggested earlier, I cannot say. It would certainly have abridged their labours very materially, but it will be more satisfactory to you to learn (and perhaps also to the writer) that no such rough and ready mode was adopted, but that repeated scrutiny and repeated votes were needed exhaustively to reduce the number of meritorious works to the comparatively small number of prizes at the disposal of the jury. That no small difficulty was thus experienced by them is shewn in a very gratifying form to you by the formal resolution, spontaneously and unanimously passed by the whole Jury, which has already been read to you, testifying their high appreciation of the merit of the English exhibit, and their regret that the limited number of prizes at their disposal alone prevented their rewarding it as it deserved, and requesting me as your representative to convey these their sentiments to my colleagues here; and further by the courteous letter enclosing that resolution forwarded to me by the Vice-President of the jury, Mons. Lefuel, at the request of the President, Herr Ferstel, who was obliged to return to Vienna directly our labours were over. Having once again visited Paris to assist at the Distribution of Prizes, on the 21st of October last, I was much gratified to receive an invitation from the five French members of our Jury, to accept from them a "dinner of honour" they desired to give to their colleagues from other countries. The Belgian member of the Jury, Mons. De Stuers, was able with me to accept this invitation; we were most warmly welcomed, and their former felicitations in the success of English architects were repeated. I subjoin a tabular statement which will be of permanent interest to place on record, shewing the number of works sent in by each nation, the number which passed the first scrutiny, and the number and quality of the rewards finally adjudged. I feel it only due to His Royal Highness the Prince of Wales, the honoured Patron of this Institute, to tell you that, in the section of architecture, he took as lively an interest as he indeed did in all the sections of British exhibits; that he took the trouble to go with me carefully through our architectural room before the opening of the Exposition on the 1st of May, spending a considerable time there, examining nearly each drawing, and making remarks on many of them which evinced not only his interest in but his knowledge of the subjects, and of the members of our profession. He has since desired his secretary, writing from Scotland, to express to me his great satisfaction at the honourable position obtained by English architects in this competition of the world. In the consideration of the

Awards, I ought to inform you that although several members of the Jury—both French and Foreign—were also exhibitors, they naturally withdrew their names from the list of the competitors, having to act in a judicial capacity. For myself I have seen with no small gratification that the choice of prizemen for England has been received without any disapproval by my own countrymen and professional colleagues. I am sure you will join with me in real satisfaction at the position taken, as regards our loved Profession, by English Architects in presence of their competition with their Foreign brethren.

SYNOPSIS OF THE ARCHITECTURAL SECTION OF THE PARIS EXPOSITION OF 1878: AWARDS BY THE JURY.

COUNTRY.	Number of Exhibitors.	Number of Exhibits.	Reserved for second scrutiny.	Medals of Honour.	First Medals.	Second Medals.	Third Medals.	TOTAL.
France ...	146	369	125	2	4	6	6	18
England ...	64	170	126	1	2	2	2	7
Austria ...	20	80	65	1	2	2	1	6
Switzerland	49	102	10	—	—	—	1	1
Hungary ...	24	28	4	—	—	—	1	1
Italy ...	14	20	10	—	—	1	1	2
Russia ...	8	11	2	—	—	—	—	—
Spain ...	11	14	None.	—	—	—	—	—
Belgium ...	6	10	6	—	—	—	1	1
Holland ...	4	4	2	—	—	1	—	1
Australia ...	2	7	None.	—	—	—	—	—
Canada ...	2	14	None.	—	—	—	—	—
Uruguay ...	2	2	None.	—	—	—	—	—
Luxembourg	1	4	None.	—	—	—	—	—
Greece ...	1	4	None.	—	—	—	—	—
Portugal ...	1	11	None.	—	—	—	—	—
Sweden ...	1	1	None.	—	—	—	—	—
Denmark ...	1	1	None.	—	—	—	—	—
Tunis ...	1	1	None.	—	—	—	—	—

Or only 37 Medals for Architects of all Nations.

In addition to the above, "Honourable Mention" was awarded to works as follows: 7 to France, 2 to Austria, and 1 each to England, Italy, Hungary, and Switzerland; while in the cases of 1 English architect and 1 Austrian architect, who had in 1857 received Gold Medals, a "Rappel de Médaille" was recorded.

METROPOLIS MANAGEMENT AND BUILDING ACTS AMENDMENT ACT, 1878.

During the current year the Metropolis Management and Building Acts Amendment Act, promoted by the Metropolitan Board of Works, has become law, after a very searching consideration by an influential Committee of Parliament. In preparing their Bill the Metropolitan Board sought

the assistance and advice of the Institute; a Committee of our members gave much anxious thought to a series of memoranda for the consideration of the Board, and their co-operation was very courteously acknowledged. Before the Parliamentary Committee several of our members gave valuable evidence, notably our esteemed Vice-President, Mr. Whichcord. In the event the Institute has been informed, on his authority, that the views of the Committee in all essential points commended themselves to the Committee of Parliament and are practically embodied in the Act which has been passed. That on so large and difficult a matter there is still room for useful alterations and new enactments will be readily believed, and when a further opportunity presents itself of considering effectually this most important subject, I hope and believe that the advice of the Institute will again be sought in the preliminary stages of any Bill which may then be proposed.

THE EGYPTIAN OBELISK.

Am I to congratulate you that the illustrious stranger, the Egyptian (now British) obelisk, has at length quietly settled among us? On the whole, I suppose I may, but it is with no unmixed feeling. A public, professional and lay, tired out with giving unheeded suggestions, at last left to those immediately interested the decision of the question as to site and treatment, in which the public would, if more encouraged, have taken even a deeper interest. The result is before us and the weary wanderer is at rest. But how? Quietly buried (I mean erected) in this great Babylon among houses and buildings that overtop it; squeezed into an unpretending nook obtained with difficulty from our corporate Ædiles. A monolith of unknown age—a witness of a period past so remote as to be realised with difficulty—a mass of 200 tons in weight, evidencing a labour and probable sacrifice of human life at its birth which must be left to the imagination—finds itself upreared on a pedestal composed of small stones (old materials in fact) instead of on a monolithic mass worthy of itself; pushed into a waste corner of our river wall, central with nothing around, and lastly, on a low level instead of on such an elevation as might add to its importance in place of lessening it. How differently and with how much dignity and taste our French neighbours have treated their Obelisk in the Place de la Concorde we must all be too painfully aware. In deploring the result, which I think could hardly occur in any other European Metropolis than our own, be it fully understood that I do not detract a jot from the well-merited praise and sympathy due to the zealous private citizen and the talented engineer, who with so many unexampled difficulties have yet brought to us this relic of the past. But what I deplore is that our National Government, or our hardly less powerful Municipal Government, did not take the matter into their own hands so far as regards a suitable site and a dignified treatment of the monument as to its substructure, and did not undertake to secure the best and most impressive surroundings for such an addition to the interest of this metropolis.

COMPETITIONS.

The question of architectural competition seems next to demand a word from me. A vexed question this among ourselves and among outsiders. A condition of things created and maintained entirely by ourselves, and, as I think, an unhappy condition of things for all parties, wherein we are placed in the position of "touting" for work which should come to us as a right and a compliment. Heartburnings, disappointment and jealousy are the children of the system; while the specious suggestion, that by this means alone, or chiefly, true merit is to be unearthed and recompensed, emanates surely from some malicious sprite who joys in our distress and divisions. The mistaken public view of competitions is of course largely due to our young and zealous architects who desire sometimes to run before they can walk, and rush into attempts, repeated to their sorrow

again and again, which, alas! bring only occasional success against enormous disappointment. They would really gain, if they could only think so, by doing patient, quiet and even unknown good works, bringing no disappointment but only delay in the recognition of their power, which would then become by experience greater day by day. Such quiet labours, such gradually developed talents would bring them under the eye and judgment of their seniors, and would surely bring to real merit its due reward. In due proportion to that merit would those of real genius become separated from the ranks, and without the heart faintness arising from frequent failure, without the loss of time and money which can oft-times be ill afforded, that belong to the present system. No other profession than our own is placed systematically in this position, yet the "men of mark" rise from their respective ranks in each profession as they have the right and title to do. Why should we alone induce the public to hold us cheap by cheapening—I had almost said—obliterating ourselves?

An occurrence within my own knowledge during the current year has led me into these remarks, and may have some interest for you. In March last the Commissioners of Hove, in Sussex, desirous of obtaining a design for their proposed Town Hall, enquired of me, as for the time being President of the Institute, whether in my opinion "with a view of avoiding the unseemly discussions that have recently taken place with regard to open competitions, an open competition for such a work would be desirable in all respects, or whether it would not be better to limit the competition to eight or nine well known men of ability." To this I replied that, in my opinion, an open competition was the worst course possible. That a limited competition was only less bad, and that in my humble opinion the *best course* was not to choose from *plans*, but to choose a *man* "as carefully as they could, whether by vote or otherwise in a Committee (as they would indeed choose a solicitor or a physician), and having chosen him, to put themselves in confidential communication with him from the outset, "and thus save time, money and temper;" while disappointed competitors would be spared "that feeling of soreness which arises against a system which requires many men (earning their living by hand and head work) to give to a client many designs while he will actually only pay for one."

The Town Council took my advice and decided not to ask for plans, but to consider six names which presented themselves to them, and you will feel with me, I think, they will have no reason to regret the course I advocated when I tell you that their choice fell on Mr. Waterhouse, who will I doubt not produce a design in the credit of which we, his brethren, may feel some reflected share, though of course the full measure will be his own. I have reason to believe that this is not a solitary instance of "a man" being chosen by competition in place of the present system of "a plan in competition." I trust the habit may grow, and I feel sure that in the end architects as a body will rejoice in the change.

MASONS' STRIKE OF 1878.

This year has witnessed another of those distressing disorganisations of trade and good will—"The Masons' Strike." It was, indeed, nominally confined to the masons' trade; but it is within the experience of us all that when one important trade is in a state of hostility to the conditions of its labour, other trades are also seriously affected. True it is, happily, that in these days strikes have lost that ferocity which once disgraced them; that they are conducted more calmly, and even with kindly personal feeling. But unhappily we see as yet none of that spirit we would hope for to submit disputes—arising frequently in misunderstandings only—to independent and therefore impartial arbitration. Earnest effort was, as I know, made on this occasion with that object; and I do not believe its failure is to be ascribed only to the workmen. Exhaustion on their part, which this year appeared to be the sole reason for their ultimate submission, gives, alas! no guarantee against the recurrence of strikes under circumstances possibly less peaceful in their result.

GENERAL CONFERENCE OF 1878.

In the first year of my becoming your President, *i.e.*, in 1876, a General Conference was held; and again this year. At both of these, but especially at the last, a very large number of our brethren from all parts of the country attended; and this year the "Société Centrale des Architectes" of Paris delegated one of their members to represent French architects by our side. I hope that the organisation of these Conferences will be carried out with increasing care for their successful issue. It is my conviction that, while it may not be possible to describe or measure in precise terms their results, yet they have results for good and are fruitful in benefit to our profession; and that this is a wide-spread conviction is clear, from the fact that each year the numbers attending have been larger. At the Dinner which enlivened the gathering this year, we had the pleasure of seeing, in goodly numbers, representatives of each class of our members, and not a few distinguished guests. Indeed, I am informed that a larger number, than ever before attended, did so on this occasion; an evidence, I hope, of the increasing regard in which our Institute is held; and I am sure you will not forget the gracious letter from His Royal Highness the Prince of Wales, expressive of his sympathy with us, and his regret that he could not on that occasion, at least, have been with us. While on this subject, I ought not to omit to notice the Congress of Architects which has just been held in Paris, to which we received an official invitation. It unfortunately happened to be held when neither your President, nor any of your Vice-Presidents, could attend, but English architects were not unrepresented there, some well-known members of the Institute having attended, and having duly spoken on behalf of their brethren here.

ARCHÆOLOGY.

I have not this year many such triumphs of archæological research and discovery to record as in my last Address. We now probably know all that Dr. Schliemann is likely to be able to teach us as to Mycenæ. With a noble restlessness he has been exploring and excavating in Ithaca, but has unearthed no antiquities, and has made up his mind that none are to be found, and that he must fain content himself with having, as he believes, identified the sites of places made classical by Homer; but he returns to his labours in the Troad under more favourable circumstances than before, and with renewed hope and enthusiasm. At Olympia, German explorers have been perseveringly continuing their work, but unfortunately they have not, I believe, been rewarded by any important discovery.

The site of ancient "Dodona" has been further identified by Mr. Carpanos, who has found a number of works in bronze, which, though of a low style of art, have nevertheless much interest archæologically, and have been useful to him in sustaining his identification of the city. He has, however, discovered no architectural remains and but few sculptures, and those of small interest.

In Italy, indeed, we are told of an interesting discovery near Monte Gargano in Apulia, viz., of the City of "Sipontum" mentioned by Strabo and Livy, which seems during some of the volcanic earthquakes, of which traces are everywhere to be seen in that locality, to have subsided and been bodily swallowed up while the earth closed upon it. Its buildings (of course, overthrown and ruined), but still *in situ*, are upwards of 20 feet below the present soil. The authorities of the locality and also the Italian Government are taking steps on a liberal scale to pursue the excavations. Porticoes and temples have already been laid bare, while many stones, with inscriptions of various value, sent to the National Museum at Naples, will soon engage the attention of classical

students and archæologists. Doubtless, ere very long, detailed descriptions will be forthcoming. Meanwhile, I would only record the fact that, in the year 1877, a second Pompeii has been laid open to us.

I will not quit this part of my subject without referring, as in former Addresses, to that land of all lands, interesting to us from associations of art history, but above all of faith in our religion—Palestine. Much has been done there as you know, and the zealous Committee who are directing the operations, or rather collecting the means for the operations, having completed a thoroughly reliable survey of the country west of Jordan, are now proposing to follow the "excavating" examples set them by other discoverers; to search out *under ground* and identify the sites or remains of buildings, the history of which appeals to our highest and holiest feelings, because they have, it may be, been actually sanctified by the bodily presence of Our Saviour while on earth. Around the Sea of Galilee they propose to work, and most of you have no doubt already received, with their appeal for funds, a statement of their intended operations, which must awaken extraordinary feeling even by the bare recital. The modest sum they need is, they say, only £2500., and they have, I am sure, our hearty wish that they may readily obtain it. It might not be perhaps deemed inappropriate if some moderate subscription were made by this Institute, if only as evidence how truly we wish them success. While, however, sympathising most cordially with them, we architects have a right, I think, to complain of a most singular imperfection in the composition of their proposed exploring staff, which is to consist of Royal Engineers, of a geologist, a naturalist, and an Arabic scholar, *but no architect.* When the first objects of their quest are to be for the sites and remains of ancient buildings, to be without an architect with them seems to me like attempting to read history without having learnt to read. This, surely, only needs to be mentioned for the Committee to supply the omission, because many earnest and competent men among us would, I am sure, readily volunteer for the work on payment of their actual expenses only. If I may be allowed to say so above a whisper, I would suggest that one of the Royal Engineers could better be spared than that the party should be without an architect to take an intelligent record of plans and arrangements of unearthed buildings—to make reliable drawings of mouldings or sculptures that may be found; in short, to impart to the undertaking that peculiar kind of power which an architect's special training gives him, and without which aid the results of the expedition are likely to be only half satisfactory.

SESSIONAL PAPERS.

I must resist the temptation to consider with you many other subjects of professional interest to all, and to architects in particular, which have been ventilated during the year past: such as the great subject of technical education for our artisans—the electric lighting of our cities and public and private buildings—the adequate supply of pure water to this huge metropolis—the hitherto extraordinary delay in carrying out the intended beneficial operation of "The Artisans' Dwellings Act"—the many important street improvements in progress and projected—the annihilation of the Thames as a barrier to circulation between North and South London, by the gradual and early abolition of all bridge tolls. Want of time and space, and regard for your patience, warns me that I must only allude to these interesting subjects, some or all of which may perhaps form the subject of Papers to be read in this room. Equally, I can only barely refer to the very valuable and instructive Papers read before you during the last Session, and the frequently prolonged discussion which took place on them. I ask, however, while on this subject, to be permitted to urge on our members, that, to secure a really practical interest in our meetings, we ought to take up courageously the challenge so frequently

made to us, and to discuss among ourselves—with that special knowledge we ought to possess and which many of our members do possess—technical questions affecting the life and happiness of those whose houses we are called upon to design and arrange. It ought to be impossible to allege with truth, as is so often done, that architects care only for the æsthetical, and delegate to subordinates the vital questions of ventilation, warming, lighting, sanitary arrangements and cognate matters.

The Past and Future of the Institute.

And now to turn for one minute to the subject with which I propose to conclude my Address, viz.: The Past and the Future of our Institute.

In referring to the Past of our Corporate Life let me render a heartfelt tribute of gratitude to those who founded the Institute, and who through so many painful and even discouraging years watched over its infancy and struggles into greater strength. They began their labour when the appreciation of Art as such in architecture was, if not forgotten, yet peculiar to a very few and utterly neglected by the large body of the public. They have some of them lived to see the time when art study and hence art knowledge has become recognised as *a necessity* to all ranks, from the pupil at a Board School, part of whose *compulsory* education is now to learn to draw, passing on through the public schools of Science and Art, gradually establishing themselves throughout the length and breadth of the land, and spreading art knowledge, refinement in taste, and appreciation of the beautiful among all the middle classes; then reaching upwards to higher social ranks of society, among some of the members of which higher class it was once thought rather a mark of distinction to profess ostentatiously a contemptuous indifference to any study so unimportant as that to which artists devote their lives, but where now it is happily deemed a mark of ignorance to be unable to enjoy intelligently, and to discuss with knowledge, artistic questions as they may arise from time to time—questions which are now even of sufficient importance occasionally to agitate society. Those early members of our Institute laboured on with their good work, and with a faith and prescience that does them infinite credit, and can never be too much appreciated by us their successors. They laid the foundation of the society of brethren they were endeavouring to form on—Firstly, a more and more careful study of the refinements, the hidden beauty (to be revealed only to the earnest and intelligent student), and the grand scope of architecture taken as a Fine Art; and, Secondly, (and no less) on strict integrity of practice in the discharge of the manifold duties of a profession where the architect must be as it were a trustee for his client, while he must be absolutely just to those who are employed under his direction. That the structure of our Institute has well and nobly stood on these solid foundations, and that they are still deemed essential to its vigour and usefulness, let the gradually increasing roll of names on the list of members, and the fearless position we have gradually become able to take before the public, be the reply.

It remains now with us, and for the future with those who succeed us, to lose not an inch of the ground that has been won; and to encourage us we may remember that the effort to keep up motion is small indeed compared with the force originally necessary to overcome inertia and give a momentum for the first time.

In my last Address I was only able to refer in terms of hope indeed to my own expectation that the changes in the constitution, and in the position of members of our body, would work well

and prove beneficial. Now, happily, I am able to point to the success of those changes as a fact. So far from any diminution in our numbers having taken place—as some faint-hearted ones did prophecy—you have heard already the increase that has taken place since 1876 (the year of our changes) in our professional members; and that, I am pleased to say, in due proportion between metropolitan and non-metropolitan members.

With regard particularly to our non-metropolitan members, I desire to say a few special words. I dared to express my belief last year that these gentlemen deservedly honoured, trusted, and for the most part fully engaged in important works in the several localities where they were settled, could and would show that they had ideas of professional brotherhood and professional action not limited to a locality, but that they would recognise the Institute as their centre of professional thought and organised action; while labouring earnestly and usefully in their own spheres of action respectively they would feel that the central body was deserving of their regard and support, and would be also anxious that their works and doings far away from London should be known to and approved by their brethren here. This has been, I see, sometimes called "Centralisation"—using that term not as indicating, as it should do, a medium of strength and vitality radiating from a centre to all distant members of a body corporate, and receiving back strength and vigour from them; but as a term of reproach, inferring that a centre and a centre only shall exist, to the maintenance and importance of which all distant organisations are to be ministers only. Doubtless such a state of things must have a speedy end in the exhaustion of the extremities, and the ultimate consequent paralysis of the centre left without circulation and nourishment to be derived from them. The word I would use would be Circulation in place of Centralisation. Our distant brethren, I believe, regard the Institute and membership with it in the light of an Insurance for professional aims, objects, interests, and, if need be, defence, and not only as a medium for study and information; for though these, no doubt, are of grave importance, they are not the only objects we all have at heart.

Such morbid Centralisation, however, I am most thankful to say is not existing with us, as we have seen. The extremities of our organization are no less vigorous and growing than our central body, and I am sure I speak not only for myself but for all the members of the Council, and for all London members of this Institute, when I say that any sort of means that can be suggested and is capable of being practically worked out, which shall cause or conduce to greater intercourse with and amongst our scattered constituency, will be received with the most hearty welcome and the most sincere co-operation by us all. In the excellent Address made last July to the Society of Architects of Manchester by their new President, Mr. Alfred Waterhouse, it is suggested that our Conferences ought not always to be held in London, but occasionally in some of our important provincial cities. I concur with him in thinking this well worthy of consideration, though there are obvious difficulties (chiefly financial ones), which would have in some way to be met. But let me in the name of all our members, as I am sure I may do, repudiate, in the strongest language I can use, the idea lately broached by an irresponsible writer that London architects as a body so far forget themselves as to hold their provincial brethren cheap, and to assume arrogantly an attitude of superiority to them when attending our Conferences or our Meetings here, quite unjustified by the comparative importance and excellence of their professional works, as we shall be forward to admit. How widely different from this is our feeling the large majority of our distant brethren well know; the cordial welcome and generous hospitality invariably extended by them to the representatives for the time being of this Institute, whenever they visit any of our important cities, is sufficient evidence that those who have affected thus to speak in their name are unauthorised to do so, and ignorant of the true sentiments of their self-constituted clients.

It has been my happy privilege since this time last year, to visit our professional brethren (at their earnest and cordial invitation) in more than one important city, and last not least in Dublin, where I found Irish architects most keenly alive to our action, and whence several new members have expressed their intention to enrol themselves; while our members in Scotland also are increasing each year, no less than the architects of our chief provincial cities. I should indeed be ungrateful and insensible, if I did not take this opportunity of making known to you, that the warmth and consideration with which I have been received by our professional brethren in all parts, as representing you, cannot be exceeded, and deserves your cordial acknowledgment; and that the universal wish in every place I have so visited is to enjoy closer connection with the Institute, which I have always found regarded with respect and sympathy, and never with jealousy.

It is my earnest hope that during the coming year some scheme of mutual systematic working together for professional objects, throughout Great Britain and Ireland, shall be brought about by the Council, whether in the mode indicated in my last year's Address, and embodied by the Council in a paper sent to all known organised societies in the kingdom, or in some better way. That communication has as yet only been very partially responded to, but this seems to me the natural and necessary sequel to the work of the last two years. That it is full of difficulty is true, but that any difficulty, fairly faced and grappled with, need be deemed insurmountable, I am loath to believe.

And now leaving consideration of our professional members, whether in or out of London, may I not ask you to rejoice with me at the very great success of our invitations to lovers of art and science outside our profession to join our ranks. Fully as I believed that a sympathy with us did exist among men of intellect and education, which only did not express itself from want of opportunity and knowledge of our aims, objects and principles of professional life, I confess I am no less surprised than gratified to mark the list of names of those who have been pleased to join us in less than two years as Honorary Associates—numbering as they now do no less than 77. You will see among them the names of men of the highest social and intellectual rank; Artists of the highest position and universally acknowledged power; Engineers recognised as being some of the masters of science of our day; Church Dignitaries who have recognised how inseparably bound up are the deepest feelings of religious faith with the art that has ever delighted to symbolise and adorn the glorious fabrics which are everywhere the external evidences of that faith; Members of Parliament who are among us with the object, we cannot doubt, of becoming if possible more able in their places in Parliament or elsewhere to speak with more knowledge, and therefore with a greater sense of responsibility than before, on questions of architectural art and architectural practice; Antiquarians who thus testify to that great function of Architecture which makes her works the most reliable, while the most enduring, witnesses of the history of bygone ages; Amateurs and Dilettanti who have come here in the hope (not I trust to be disappointed) that they will add some further items to the knowledge they already possess, and be enabled further to value those architectural efforts of past time which they with us have already learned to admire. That the class of Honorary Associates is a growing one, you have had evidence in the list of new recommendations you have heard read this evening, and I for one have no fear, in spite of the Cassandra-like predictions of some of our dear despairers or candid friends, that this class is only a novelty to last a short space and disappear. I confidently look forward to its large increase. Nor have I any fear that the strictly professional objects and proceedings of this Institute can ever suffer, or become less important by being conducted in the presence and under the useful criticism of such a public as the class of our Honorary Associates must, I am glad to think, for the future always afford us. I have reason to know that the existence of such a class, composed of such members as are

to be found in it, has already had important influence for good to architects in the highest quarters; while we have had already evidence of the satisfaction of some of its members with their new position, in the valuable and interesting Papers they have read before our Ordinary Meetings.

In concluding this somewhat lengthy Address, a thought is in my mind begetting one question I desire to put to you on this the last opportunity I shall have of thus addressing you. My thought and question is: Shall our Institute henceforward be an active or a passive body? For all the early years of its existence it was necessarily more or less passive—rarely coming into public notice, rarely exercising either towards the public, or towards or on behalf of its members, the powers with which its organization really invests it, and which its earnest members have always so much desired. Its Transactions, no doubt, have always had much interest for its members, but it exercised so little influence on the great world in which we live, that its very existence, as an organized and still less as a corporate body, has hardly been known to the public till lately, and was almost unheeded by them.

During the last few years, however, it has entered into a more active phase of existence. Its finances, its earnestness, its diligence, and therefore its powers have largely increased. Its labours have been extended into new fields of action. Its opinion and its assistance have been solicited as they never before have been. Its Council has been more and more frequently called on to decide questions arising on professional practice, and to arrange difficulties between professional brethren, and between architects and their clients. It has become, in fact, more known; has interfered with some effect in public affairs; and has enrolled among its members a larger average annually of professional men in all parts of the kingdom than formerly. It has further enrolled in the new class of Honorary Associates a number of that outside public to whom previously its existence was unknown and uncared for, and these have testified their sympathy with it by attending its meetings, joining in its discussions, and as I have said, even contributing Papers to its transactions. Now I ask our members which of these two conditions of its existence is more satisfactory to them?

There is surely evidence of a state of vitality and energy, as distinguished from one of torpidity, and one for which I can claim only my share of credit or discredit, for be it remembered no President of yours could organise or maintain such a state of life without the assent and continued support of his colleagues on the Council, and of the members generally—support that has been given, and which I can hardly find words duly to acknowledge.

Such a state of vitality involves, no doubt, on the part of those who have the conduct of your affairs, zeal and vigilance as to matters daily occurring around us of interest to the profession, as well as a large devotion of time and thought.

It is for you, the members at large of our body, to say whether in their actions your representatives have correctly interpreted your wishes; and if they have done so you will, I am sure, afford them in the future, as you have indeed done in the past, your hearty and cordial encouragement. There is not a member of the present Council who is not ready ungrudgingly to give his time and best efforts to maintain and strengthen the position we have attained, and who will not be fully content to find as his reward that he is encouraged and loyally supported by you. I dare to be confident on which side your verdict will be given, and to anticipate for our Institute a growing and still growing importance and usefulness—feeling sure, as I do, that in its active life benefits will accrue to the public at large in equal proportion as they accrue to ourselves.

With a sincere hope that the Session now opening before us will be in every way pleasant, useful, and lastingly effective, I thank you for the patience with which you have listened to me.

THE VOTE OF THANKS.

THOMAS H. WYATT, F.S.A., *Past President*,—Sir, as one of your predecessors in that chair, may I be allowed in a few words to propose a vote of thanks for the remarkably interesting and industrious Paper which you have laid before us. You have, Sir, pointed out some of the difficulties of annually producing an Address of this sort. I can quite share your feeling; but I venture to think that your immense industry has conquered those difficulties in a most remarkable manner. I would also venture to inquire whether, as the election of President is now only for two years, it would not be easier for a future President to give one such lengthy Address as we have heard to-night at the beginning of his term of office, and at the end of it to give a brief history of what with regard to the affairs of the Institute has happened during his period of office. No one, I think, Sir, can doubt that the increase of our numbers has been satisfactory. That that has been the case amongst the professional members is a matter for congratulation; but I attach immense importance to the accession of Honorary Associates, and I think you have not said one word too much on that subject, for I am sure that the benefit we shall derive from their knowledge, influence and presence, will be very great. You have said, very properly I think, that it would be wise not to attempt any extensive or elaborate alteration of these premises for the purposes of the Institute. I think that is a feeling generally shared. Any large expenditure would be most injudicious. Let us hope that, before long, we may either acquire a larger amount of possession of these premises, or hear of other premises better suited to our increased prosperity and interests. You have given us, Sir, a melancholy list of deaths which have occurred amongst our number. We have lost some honoured names: Sir Gilbert Scott, Mr. Nelson, and last, not least, Mr. Cockerell, in the short interval since you last addressed us. That is a most painful and sad record. The loss which at this moment depresses me most acutely is the recent death of him who has been long accustomed to occupy the now vacant chair by your side. As Professor Donaldson has said, he was the son of a most honoured member of our profession—our first professional President—a man of the greatest knowledge and refinement, and the son never for one instant did discredit to his name. On the contrary, young as he was, he achieved what has been the ambition of my life, for he had secured the confidence, respect and affection of his clients. With regard to the French Exhibition, I think there is no one who does not feel the great value of your services. How great has been the sacrifice of time and the anxiety to you, everybody who has had duties of that sort to perform can appreciate; and it will be a long time before we can discharge our debt of gratitude to you on that account. On the subject of competitions and conferences, your observations accord so entirely with the feelings I entertained when I occupied the chair that I need only say how I most cordially concur with them. I beg leave, Sir, to propose a vote of thanks to you for your most interesting and able Address, with many wishes for your continued health and prosperity when you leave that chair.

FREDERICK LEIGHTON, P.R.A., *Hon. Associate*.—Mr. President, the members of that class to which I have the privilege to belong—the Honorary Associates of this Institute—will, I am sure, feel it a great honour for one of their number to have been called upon to second the motion of my friend, Mr. Wyatt, that the thanks of the Meeting be offered to you for your most remarkable Address; and I myself feel honoured that the command to do so should have been laid upon me. I will do so with brevity, partly because I am loath at this late hour to trespass upon the

patience of this assembly, and partly also because I feel that, in the lucidity of its statements, in the breadth and elevation of its views, and especially in the extremely satisfactory nature of its general tenour, the Address stands self-recommended. I feel that it will be accepted by this Meeting with gratitude and thanks without my advocacy. You have, Sir, unfolded before us a picture of prosperity, growth and vitality, of beneficent and enlightened influences at work, which I am sure must be highly gratifying to all Members of the Institute, and I beg them to believe it is also a highly gratifying picture to those who look upon it, with interest and sympathy, from its outer precincts, —as I do myself. But the picture is not unchequered: it has its dark shadows and contrasts; and in the too long obituary you have recorded there are several names which I personally cannot hear mentioned without emotion. There are the names of two honoured members of the Academy to which it is my pride to belong, and the name of one of the dearest and truest friends I ever had—a man who had the rare gift of winning, and the rarer gift of retaining, the hearts and affections of those who had the privilege to know him—one whose loss is irreparable to those to whom he was dear. It would be impertinent in me if I were to attempt to touch upon any portions of the Address which deal with the special affairs of the Institute within its own peculiar sphere; but, Sir, you touched upon one or two points of general interest on which I may be allowed, perhaps, to say a word or two. You alluded, for instance, to the ancient obelisk which has lately been erected, I had almost said "mislaid," on the parapet of the Thames Embankment. I embrace with joy the opportunity of expressing my heartfelt concurrence in your concern at this its latest vicissitude. That ancient monolith is an old friend of mine. I have seen it slumbering on the sands of Egypt under an Egyptian sun, and by the margin of waters bluer than those which flow from the urn of Father Thames. I saw it encased in the ship *Cleopatra*, ploughing the same blue waters off the coast of Morocco. I have seen it again, alas, seeking the sun in vain, in its last resting place—showing to ages to come what may be achieved by British munificence, British patriotism, British energy, and the skill of British engineers; and showing also how a monument may be so placed as to set aside all the "eternal fitnesses" of things æsthetic—adorning nothing, emphasising nothing, by nothing emphasised—so placed, as if parenthetically, between two highways perhaps amongst the finest in the world; so placed that neither leads up to it, and both seem to hurry past it. You alluded also to "competitions," and I may, perhaps, be permitted to say on that subject that here again I am in harmony with yourself. I share your very grave doubts whether "competitions" offer the best means of ascertaining the person to whom to entrust, and from whom we may expect, a true work of art—whether, in fact, they always result in the survival of the fittest. Sir, in your Address, there is one portion, and one only, to which it is in my power to add something. You spoke of the Paris Exhibition, an Exhibition in which, by the general and ungrudging consent of the European artistic public, British art has earned no common meed of distinction, and you, Sir, have dwelt with justifiable pride on the honours which have been accorded to British architecture; but, Sir, you have *not* told this assembly of the golden opinions and high esteem which you won for yourself personally on that occasion. Allow me to do so. Gentlemen, I have had the pleasure to serve with Mr. Charles Barry on the Royal Commission for the Paris Exhibition. I have had the gratification of hearing from M. de Ferstel, the President of the jury for architecture, his high appreciation of Mr. Barry's eminent services on that jury. I am, therefore, in a position to testify, both from my own knowledge and on the high authority of another, to the untiring zeal, the genial catholicity, the admirable tact and judgment which made him so valuable and influential a member of that jury; and, if I may be permitted to judge from what I have heard and seen to-night, so admirable a President of this Institute. My

sense of these qualities very naturally enhances the pleasure with which I second the resolution: that the thanks of the Meeting be accorded to the President for his Address.

The vote of thanks was carried by acclamation.

The PRESIDENT.—I shall not trouble you, Gentlemen, at this late hour, by doing more than say that I thank you very heartily for your concurrence in the vote of thanks so kindly proposed and so eloquently seconded. I have already told you that the only reward which the President and Council can desire, and with which we shall be most entirely satisfied for any devotion we may have given to matters interesting to you, is your approval—your cordial approval and encouragement. I have asked to-night for your continued support, and I hope I may take your applause as a promise of it. If you give us that, we desire nothing beyond it, and I assure you it is most grateful to me in particular. I again thank you most heartily for the complimentary vote that has been so enthusiastically carried.

II. FREDERICK PEPYS COCKERELL: A MEMORIAL SKETCH.

IN the cemetery of Auteuil near Paris, on a sad November day, was laid to rest all that is mortal of one who has left specially to the Guild of British Architects the legacy of a most honoured name. An allusion in the Presidential Address of last Session, to a loss then so recently sustained, touched the heartfelt sympathies of the audience by appeal to the mute eloquence of an empty chair. With what grace the functions of Honorary Secretary were discharged by Frederick Pepys Cockerell is unanimously acknowledged no less by those whom he represented than by the artists of foreign nationality whose interest he was successful in associating with our own English aims and work. His skill as a linguist in the expression of his own genial and appreciative mind made him a true exponent of those fraternal sentiments by which British Architects are assuredly actuated towards their foreign friends and colleagues.

When summoned from a life bright in social and professional success, rich in the promise of future distinction, he was on a visit in Paris, spending his days in the Exhibition Buildings and a welcome guest at the tables of distinguished professional colleagues. On the 4th of November, 1878, friends assembled to do him honour at the house of M. Duc—whose own decease occurred only a few months afterwards—were shocked to learn that their last words with him had been an unknown farewell. Death had been immediate upon a sudden seizure that day. At his grave side a tribute of respectful sorrow from those Frenchmen whose work he had ever warmly appreciated and whose intercourse had brightened the closing hours of his life was feelingly paid. M. Hardy (Architecte de l'Exposition Universelle), M. Vaudremer (Architecte de la Ville), M. Pellechet, all three comrades of his youthful travel and study, and MM. Duc and Lefuel, were there; as well as M. Daumet, whose beautiful drawings for the Duke d'Aumale's château at Chantilly had been the theme of admiration in the very last letter which was gladdening home, when the dark message came that its writer could never return.

A desire having been expressed that a biographical sketch of the late Honorary Secretary should take its place among the records and papers of the Institute, it is well that the task should be performed while its difficulty can be appreciated, and the deficiencies of the portraiture inseparable from its subject can be supplied by the loving recollection of his professional contemporaries. No succession of great public works executed by him arrests attention, compelling admiration or challenging criticism; yet, who is there among the most distinguished in architecture who does not feel the loss which was sustained in his death? As an artist he will be remembered—as a man of delicate taste and fine perception, of generous impulse and catholic liberality, which, harmonizing the intellectual with high moral qualities, formed a character of rare attractiveness not easily conveyed to the minds of any who were strangers to its refining influence.

Frederick Pepys Cockerell, born in 1833, was the second surviving son of Charles Robert Cockerell, R.A., and Anna Maria his wife, daughter of the engineer John Rennie. At that time no name was more illustrious than his father's in the society which awards honour to artistic genius. Some sentiment of romance, moreover, always affected the minds of

many friends towards the man who for years of early youth, though gifted with every grace of presence and every social charm which could fit him to shine in cities, had devoted himself with a rare singleness and courage of ambition to the exploration and study of buried sculptures and gems of architecture cruelly maltreated,—reckless of the peril which in those days besets the traveller in continental Greece, and still more him who committed himself to the yet ruder life of her island population. Shortly after he was appointed to the Professorship of Architecture in the Royal Academy his interest in the reputed works of William of Wykeham led the elder Cockerell frequently to visit Winchester College, and there he placed his son Frederick as a commoner in the year 1845. Winchester was at that time a very rough school. The authorized despotism of the sixth form, and too much unauthorized self-assertion of the stronger over the weaker, formed, however, a discipline not wholly disadvantageous to such of the new comers as were gifted with courage and temper. Old Wykehamists of his own standing, and many who at his coming were high in the school, remember Cockerell a bright-faced curly-headed boy, who, while never subjecting himself to the severe punishment which awaited rebels against constituted authority, always managed by intuitive tact and good humour to disarm the terrors of the bully. Sufficient that he won his way rapidly to popularity and the full enjoyment of a school life to which he always looked back with pleasure and affection. Already, in so early boyhood, his father seems to have discerned and appreciated in him some germs of an æsthetic tendency. A little entry in Mr. Cockerell's diary during his son's first holidays is touching when read in the light of after events: "June 28, 1845. With my boys to the Academy Exhibition; judgment and taste in Fred; more combativeness in Robert." The one was to be the friend whose loss is now deplored; the other, who set his heart upon a soldier's career, fell gallantly in his twentieth year as a lieutenant in the Royal Artillery at the memorable battle of the Alma.

Meanwhile the Winchester curriculum of that date gave no encouragement to the acquirement even of the rudiments of art or science. There, proficiency in the mechanism of Latin verse was the special avenue to distinction, and it does not appear that, in this, young Cockerell achieved any marked success. The bent of his disposition was rather shown in the collection of little drawings, fruits of feeble tuition, which he treasured as memorials of the school friends whose names they bore. At the close of 1848 he matriculated at King's College, London, and the reason for this so early change in his course of studies may probably be found in the name of the department to which he was attached, viz., "Applied Science," with all the branches of which his father, clearly destining him to the profession of architecture, desired that he should now begin to be conversant. For about five or six terms he is recorded in the College books as constantly attending the lectures, during which time his fellow students were more impressed by his presence, vivacity and cleverness of conversation, than by any apparent devotion to severe study. One who sat next to him at Professor O'Brien's lectures on natural philosophy remembers Cockerell's note-book as being fuller of deftly traced towers, pinnacles and spires, than of the teaching which its pages were intended to record. He was observed to affect much the companionship of the medical students, with whom as an "occasional" he attended the anatomy classes. Familiar, doubtless, with a favourite theory of Professor Cockerell that the human frame is the basis of all idea of beauty, he set himself with interest to a study which must always be the foundation of correctness in figure drawing. It bore fruit

in the facility which he afterwards enjoyed of thorough truthfulness in the expression of an instinctively delicate sense of form. In designing decorations he would outline a figure, two feet high from head to foot and up the other side, without taking his pencil from the paper. This dexterity was no less edifying to those who witnessed his office work than amusing in general society when, to illustrate some point in conversation or to describe a scene, a minute or two with a pocket pencil on a letter-back would suffice for a most artistic representation of form and action. It happened one day in 1851 that a student at the old School of Design in Somerset House, now a successful painter, observed a youth whose appearance struck him, but whose name he did not know, to be diligently working at the remains of an antique statue—the legs of a Faun. Hearing that he was an architectural student, the young painter commenced an acquaintance with him by expressing surprise at the then unusual devotion of time to this line of study by one whose professional intention was thus fixed. He remarked that Professor Cockerell was the only English architect, he knew, of real power in drawing the human figure. "He is my father," replied the young man with animation and delight, "and I am trying to follow him." His pride and trust in the guidance of his father were unbounded, and it is indeed impossible in reviewing his own life not to recognize the inestimable influence which the teaching, example and constant companionship of the Professor exercised in determining the form which the son's artistic temper finally received. Attendance at architectural lectures, the classes of Townsend at the School of Design, and his dutiful desire to qualify himself for a professional career, contributed probably far less to the moulding of his mind than did the breezy walks over Hampstead, the journeys to great cities and universities where the Professor had works in hand, and the visits to the country seats of eminent persons, in all of which Frederick Cockerell was his father's chosen companion. He breathed an atmosphere of education in the classical and highest signification of the word. The father's enthusiasm for art, which was as his very life, diffused itself around him as light from the facets of a brilliant. His bright flow of refined conversation, so courted abroad, never stagnated amid the closer interests of home; and not the less impressive, because neither dully sententious nor cynically dictatorial, were the maxims of æsthetics and the rules of noble life which young Cockerell gathered there. One idea of Professor Cockerell's, which often formed the subject of conversation, was that, for any approach to perfection, a modern building demands the co-operation of two architects, the one to devote himself to utilitarian arrangement, the other to artistic embellishment. The Professor would even go so far as to argue that no man could give equal and adequate attention to both subjects; and, having himself personal experience of such division of labour in at least one instance,* the suggestion was no bare theory. It may not unnaturally have increased what has been alluded to: the apparent indisposition of a boy to devote to the drier details of the prescribed instruction the same application as accompanied the exercise of his pencil. Withdrawn, however, in his seventeenth year from the generalities of class-rooms to more intimate practical training, he must soon have been disabused of any uncertainty as to the requirements of actual practice. Mr. Goodchild, for many years the valued chief clerk, and through life the faithful friend of Professor Cockerell, who as architect to the Bank of England had offices there, gave him the first lessons in perspective

* The London and Westminster Bank (1837-39) was a joint production, the exterior being especially Mr. Cockerell's work; the interior was by Mr. (afterwards Sir) William Tite.

drawing; and new offices at the Bank were then in course of construction. Designs had frequently to be furnished for Branches established in provincial towns, so that there was no lack of elementary study. Identifying himself, meanwhile, with every institution connected with the architect's profession, at one time engaged among the working builders upon a scheme for a provident club in their interests, at another assisting in the business of the Artists' General Benevolent Institution, he became every day more heartily pledged, to his father's intense gratification, to share the moral responsibilities as well as the distinction attaching to his name. During the summer of 1850, with an independence then not often confided to boyhood, but forming part of the Professor's educational design, he made a sketching tour in northern France. He returned from the beauties of Abbeville, Avranches and Morlaix to distribute his autumn between the School of Design and some subordinate occupation obtained for him, by the kindness of the late Sir M. Digby Wyatt, in connection with the Exhibition Building in Hyde Park, which, as a novel and an ingenious solution of a difficult question, was attracting great public interest.

The story of the years yet to elapse before Frederick Cockerell launched forth to face on his own account the fortunes and rivalries of the professional world, would be rather a record of his father's work than of anything for which he could be individually responsible. Pleased to be at Professor Cockerell's disposal either for labour or recreation, or for the happy combination of both, he enjoyed enviable opportunities of increasing knowledge and perfecting taste. Interspersed with frequent sojourns at Liverpool, at first as a mere student, but later as superintendent of ornamental details in process of execution at St. George's Hall, to which the Professor gave years of untiring labour, came visits to Apthorpe and the Grange, entertainments by heads of houses at Oxford and Cambridge, and innumerable other introductions which were the more delightful to him that he thus learned how widely shared were his own affection and reverence for his father.

He always had a pleasant recollection of some summer days spent with Mr. Fripp in drawing on the Thames, which only confirmed his love for the colour-box and open-air studies; and hardly a year seems to have passed without his obtaining permission for a trip more or less prolonged on the Continent. Drawings of the Maison Carrée at Nîmes, and of the Pont du Gard, bear the date of 1851. His constitution was at that time wonderfully robust; and the fair, manly presence and lofty stature of one but a boy in years attracted friendship abroad, which rapidly matured under the influence of his genial manner and loveable nature. The writer of these lines must be pardoned if he yield to the temptation of submitting to friendly eyes a more descriptive picture of noble boyhood than the conventionalities of English biography would permit to be translated by the most loving pen; and which opens a glimpse of a more serious side of the well-known sunny character, unsuspected perhaps by mere casual acquaintance, but none the less of its very essence to the last, and not to be omitted from a retrospect that aims at truth. The extracts are from a letter of tender condolence written by a French gentleman, whom the chances of a crowded inn brought into Cockerell's close companionship that summer:—

"C'est à Nîmes que je rencontrai, dans l'été de l'année 1851, Frédéric Cockerell et son frère Robert,* tous deux jeunes et charmants, et, de plus, d'une beauté physique remarquable. Frédéric

* Killed in action, September 20th, 1854.

grand et fort, taillé en Spartacus; Robert, fin et délicat, plein de charmes et de grâces. Cette rencontre m'a laissé une impression si douce si agréable qu'aujourd'hui encore, à vingt-huit ans d'intervalle, ce charmant souvenir est resté dans ma mémoire aussi vif et aussi frais que si cette rencontre avait eu lieu récemment. . . . . Frédéric etait la bonté même, mais il était si animé, si exuberant, si actif, il avait tant de vie, de force a dépenser qu'il fallait bien que, bon gré malgré, son frère le suivît partout, effrontant toutes les intempéries, les rayons ardents du soleil aussi bien que les pluies diluviennes très fréquentes en ces contrées. Quelle que soit la fatigue éprouvée la veille, et l'heure avancée à laquelle les deux frères s'étaient couchés, ils se levaient de bon matin et la prière était le premier acte qu'ils accomplissaient. Ce jeune Frédéric si fou si insouciant devenait à l'heure de la prière grave et recueilli, ce n'était plus le même homme; agenouillé au pied de son lit avec son frère, il priait avec ferveur."

There are marked spots in the youthful life of most men who have at any time excelled, to which may not unfrequently be traced some determination of their opinion and taste, or at least their approximation to some more or less model ideal. In the profession of architecture the disposition must sometimes be suppressed, and constantly modified by the exigencies of circumstance and duty, but the impression once clearly made will never be entirely effaced. To some months of severe study at Paris in the spring of 1853, and to the admiration he there conceived as much for the system as for the results of the training in the Parisian school, must be referred a perhaps somewhat exaggerated estimate formed by Frederick Cockerell of the lofty aims and ambition of perfection which he deemed specially characteristic of French architects; and in his own earlier designs the French idea is profusely blended with the classical.

Caristie, who so far back as the stormy days of 1815 had been a friend and companion of Charles Robert Cockerell at Rome, now readily undertook the direction of his son's studies, lending him drawings, advising him in his copies, and introducing him to men of the highest eminence in his art; to Viollet-le-Duc among others, and to Visconti then fully engaged on the transformation of the old Place du Carrousel and substitution of the splendours of the new Louvre. To M. Douillard too, the friend from whom Frederick Cockerell had but just parted when he died, then recognized as a most accomplished draughtsman, Caristie commended him for help which was ungrudgingly given. The seed thus abundantly sown fell on no thankless soil; young Cockerell's diligence was unstinted. "Monsieur est trop matinal," the servant would remark, who found him at work with the sunrise, while his strength and perseverance were a marvel to the friends who noted the earnestness with which he made use of his limited opportunities of out-door work. "Notre Frédéric" (wrote one) "a fait à Chartres "des séances de douze heures par un froid assez vif, pour terminer ses dessins." An interesting diary of that to him important time is afforded by a close series of characteristic little letters to his only sister. He tells of the kindness he everywhere received; how Douillard helped him to master the manipulation of ink; how Visconti made him free of his *atelier* and works; how he grudged the evenings which his letters of introduction compelled him sometimes to devote to society, as interfering with his morning's work.

Later in that year he made a fine perspective drawing of St. Paul's Cathedral, which, with some little alterations and introduction of figures suggested by the late Mr. Stanfield, R.A., a constant visitor at the house at Hampstead, was exhibited at the Academy in 1854. Cockerell was early in that year a pupil in the office of Mr. Hardwick, R.A., where there was a great

deal of business; and, under the immediate guidance of Mr. P. C. Hardwick, who found him, "from his thorough knowledge of his own favourite style of art in many cases of much use," he for the first time assisted in the planning and laying out the site for country houses, in the construction of which he was in later years himself not unsuccessful.

An acquaintance was formed at Mr. Hardwick's with a fellow pupil, now an architect of distinction, who continued ever afterwards one of Cockerell's warmest and most intimate friends. He has kindly contributed some reminiscences of their student days together, which cannot be better given than in his own language:—

"Many must remember him still as he then was, a bright handsome young fellow, full of spirits and enjoyment of life, and imbued with an enthusiastic love of art, which lasted in full vigour till the day of his death. Added to these attractive qualities he had inherited an indescribable charm of manner, which crowned his popularity and placed him in the first rank of any society into which he might be thrown. Although he was several years my junior I have always felt that, having had no previous special training, I owed to Fred Cockerell's influence and example a great proportion of what little knowledge and appreciation of art I may have been able to acquire in the years 1854 and '55. He had always lived in an atmosphere of art, and at that time was in this respect far in advance of his professional contemporaries. In the late summer of 1854 we made a sketching tour together through Cambridge, Lincolnshire, Northamptonshire and part of Yorkshire, spending our time in the study of the more important buildings. At Ely, the Dean (Dr. Peacock) gave us keys which enabled us to explore every part of the then unrestored Cathedral at our will, a privilege of which we availed ourselves without stint. I look back to this tour with the greatest pleasure. It was the first time I had been thrown into such close companionship with my friend, and the first occasion on which, with his help, I began to realize the true practical use of the intelligent sketching and measurement of old buildings. The only drawback to our experiences which I recollect was the kindly-meant but inconvenient hospitality of which we were the victims. Our fathers were then living, both equally well known to all cathedral authorities; we thus found ourselves overwhelmed by cordial invitations wherever our names became known. As we wished to devote our evenings to the revision of the day's work and laying down measured plans, this did not suit our views, and we were driven to adopt various amusing shifts to escape detection. With anyone less energetic than Fred, or less amply endowed with those genial qualities which make travelling companionship delightful, a tour comprising so much seen and done would have been impossible. But having become thus intimately acquainted, we started together without any misgiving in the early days of 1855 for Rome. In Paris, on our way, he received an enthusiastic welcome from the young French architects and painters, whose friendship he had secured during previous visits.

"The first impressions produced on arriving at Rome are usually, I believe, in the case of anyone who has looked forward to it as an epoch in his life, to some extent disappointing. They were certainly so to both of us, and it was not till we had time to become familiar with its principal features that we began to experience those feelings towards Rome which make everyone leave it with regret and draw one back at the first possible opportunity. Our artistic tastes and proclivities, partly from training, but as much I think from natural disposition, were in many respects opposed; and although the cordiality of our mutual relations was never for a moment in danger, we had many a warm discussion resulting sometimes in a practical divergence in the matter of subjects for study. Thus, while my own tastes led me often to prefer earlier remains to the works of the Renaissance, he (much to my advantage) used to point out beauties and refinements in the later buildings which I might otherwise have passed unnoticed; at the same time he showed a knowledge of sculpture and painting, and of the great masters in both those branches of art which left me far behind.

"The allusion to painting leads me here to mention a phase of feeling through which Fred passed during this visit to Rome, which was quite painful in its intensity while it lasted. This was an eager longing to become a painter instead of an architect. At that time the present gifted President of the Royal Academy was painting in Rome, and sending home (if I mistake not the year) his celebrated 'Triumph of Cimabue.' Whether the intimate companionship of such a man and the daily inspection of his work, with that of other artists then in Rome, first fired a latent ambition, or whether the conscious desire was of earlier origin, I am not sure; but the longing, as I have said, became so intense as to interfere seriously with his health and spirits while the period of incertitude lasted. This, however, was not of long duration; a letter of appeal to the decision of his father brought a long reply unfavourable to his views, but containing advice so sound and arguments so convincing that whatever Fred's feeling may have been he never afterwards suffered it to interfere with his architectural studies and training. After a stay of some three months in Rome we visited successively Rieti, Spoleto, Assisi, Perugia, Arezzo, Florence (where we stayed a month), Siena, Pisa, Lucca, Genoa, Milan, Como, and other cities. After crossing the St. Gothard our paths diverged.

"I have nothing to say of my old friend as an architect beyond what all the world knows—that he was a highly accomplished and thoroughly conscientious artist; but I had peculiar opportunities of forming a perfect estimate of his character as a man, and I cannot conclude without trying to give some idea of the place he filled in my affection and regard (as he must have done with all who knew him intimately) and the reasons for it. The first thing which made his character so fine a one was its absolute truth and simplicity. In what he said either in public or in private there was never any *arrière pensée*, never anything kept back: he would tell you his real views, his whole mind; and yet in such a manner as not to wound your feelings if it were simply a matter of opinion. His strong language—for he could use strong language on proper occasions—was reserved for shams, cant, humbug, and meanness or littleness of every description, for all which, being utterly incapable of anything of the kind himself, he had the most uncompromising contempt and horror. When to this great quality is added a most affectionate and sympathizing disposition, an unwavering steadfastness in friendship, and a singular generosity of mind in all things small and great, we have a character as noble and loveable as one could wish to meet with. His untimely death has left a void which cannot be filled again."

One would wish that the letter, from Mr. Cockerell to his son, which so emphatically determined the rivalry between painting and architecture as the aim and object of a mind delicately sensitive to the beauties and attractions of both, had been preserved. It could only have been on the most earnest conviction that the indulgent and loving father disappointed a desire so keen, and dealt a wound at the time so mortifying. For he was himself as appreciative of the glories of success as he was critical of mediocrity in painting; and his nervous pen, well skilled through years of laborious composition to analyze artistic feeling and to interpret every modulation of its faintest utterance, must have treated the subject with the most cogent argument and exhaustive judgment. Doubtless he rested his decision upon an estimate of his son's best powers, of which none could have so tenderly watched the development or so rejoiced in the promise. Yet it is more than probable that young Cockerell's ready acquiesence in the decree, which closed one bright avenue to his ambition, was dictated rather by dutiful obedience than by whole-hearted concurrence in the answer to his appeal. However that be, it often occurred to his friends to reflect whether the satisfaction of undoubted claims to distinction would not have been completer in the field of the more imaginative than in that of the more constructive art. One of his colleagues, previously mentioned, who was executing important

work when young Cockerell was in his pupilage, thought his talent eminently that of a painter, as lacking some of the more prosaic elements which are essential to an architect's full success. An opposite opinion is that of a man of great accomplishment who was much with him in Italy, and who does full justice to his drawings. Writing recently of his own delight in an intimacy which only death dissolved, he endorses the elder Mr. Cockerell's view. "Fred's exquisite sense of beauty in form," he says, "marked him out for an architect or a sculptor. I always thought him somewhat deficient in the perfect sense of colour, without which no one can become a really great painter."

The question is only of interest to those whose admiration of Frederick Cockerell's abilities may beget the wish that his too short life had been crowned with more publicity of renown. He never himself openly alluded to that critical determination of all his energies; never repined at the authority which called him back from following a light that had seemed to invite him into the more flowery path. The die was cast, and loyalty set its seal upon any expression of lingering regrets. But that he was not without skill in colouring is sufficiently attested by his Italian and Sicilian sketches; and his Arch of Titus (1855), exhibited at the Academy, is a highly finished work. Although his knowledge of the technicalities of oil was necessarily limited, few excelled him as a judge of painting; few, even among professors, could better estimate the merits or guess the authorship of a picture. To spend hours on his knees endeavouring to revive the faded colours of any old Italian canvas was to him a delight. He would be wrapt in admiration of any beautiful work of the old masters; it seemed at times to monopolize his thought. Often, when conversation wandered, he would lead it back to the subject which possessed him. Was the old spring really dry at his heart, or did it still keep green some vision of the untried land of which he felt perhaps that he had sacrificed to duty some share in the conquest and the spoil?

When on entering Switzerland he parted with his friend, it was to join his family in Paris, where the first Paris Exhibition was gathering its crowds, and where his father was engaged among the English Commissioners; and more than twenty years afterwards, when visiting Chambord, Frederick Cockerell recalled an excursion thither with some of the most distinguished men of the two countries during that exhibition summer, and of the impression made on him by the lucid criticism of Sir Charles Barry. There was indeed no lack of amusement in the French capital at that time; but the full love of Italy was upon him, and within a very few weeks he was writing home from Venice the most enthusiastic descriptions of its inexhaustible interest and beauty. For two months he could not tear himself away; then it was that he did some of his most careful work. As autumn waned, letters from Padua and Vicenza, from Mantua and Florence, from Siena and other charming resting places on the road to the Eternal City, formed a journal which delighted its recipients at home by picturesqueness of illustration and evidence of appreciative study.

Those Roman winters of young student life—what a light flashes from them to gladden the afterdays! What vivid memories of friendships formed, of lessons learned, of all the varying gleams that played upon the joyous current of the time! During that winter of 1855-56 a colony of nine young Englishmen had its abode in the Via Felice. Most were hard workers, but the dilettante element was not wholly unrepresented there, and the bonds of union in the brotherhood were so close that, while the studious were recreated, the veriest

L'Ariccia. April 27th 1855

SKETCHES BY FRED. P. COCKERELL.

amateur could not fail to gather something of the realities of art from an association which to its survivors is a lasting delight to recall. In the English society of that season, which chanced to be peculiarly agreeable and well assorted, its members of both sexes often related how the "Felice men" made their mark.

The day spent by the painters of the party with their models, it may be, or other work at home, would be from its earliest hours devoted by Cockerell to careful studies and reproductions of the most noteworthy features of Rome's palatial and monumental glories. It closed with a merry dinner gathering of all at the Caffé Grecco. No sumptuous feast was spread, no affectation of the power of expenditure permitted itself; the joke was who could dine most cheaply, and the seasoning of the repast was the good fellowship and humour of the guests. Entertainments followed at the hospitable houses to which the colony would be invited *en masse*. Tableaux arranged by their artistic skill became a favourite amusement. "Where we all did our best," says one of the party, "to enliven the society, Fred was the most successful. Besides his charm of manner and the knack he had of always looking smarter and at the same time less self-conscious than anybody else, he had a great advantage over the rest of us in his complete mastery of French and Italian. His superior knowledge of the languages and their literature, and his consequent appreciation of the best elements in foreign society, enabled him to derive more benefit probably from the stay in Rome than any of us."

If prosaic be a term not inapplicable to much of the labour incident to an architect's profession, prosaic indeed must the subsiding into the routine of office life appear to every young English student who returns to it from Italian sunshine and the ἀνήριθμον γέλασμα of the Southern Seas. Especially must this be felt when no public individuality has as yet been attained, when reward is by no means the immediate follower of toil, and the first pride of relations with an admiring client is a sentiment of, at best, an uncertain future. Cockerell went however at once always cheerily to harness on these occasions, his reward being the conscious ability to render real service to his father. For the Liverpool and London Insurance Office and other buildings about to be commenced at Liverpool he did much of the design. The Professor had resigned his chair at the Academy, and was gradually giving up all his appointments and retiring from his active share in professional life, except where a few private friends still claimed the assistance of his taste. On matters of decoration Frederick Cockerell's experience and judgment were now of value, and he is found through this year, as his father's colleague and *alter ego*, directing the progress of such work for Lord Ashburton, and at other important country seats; so that on drifting from home residence into chambers of his own he had already some repute as a young man of culture and capacity. At his father's desire he threw himself with great energy into the competition for the Government Offices, designs for which in every conceivable style and from every variety of hand may be remembered as attracting crowds of critics to Westminster Hall, where they were exhibited in the spring of 1857. But by that date, little remaining to claim close attention at home, he was away again to the inexhaustible treasuries of artistic aspirations and achievement, where nothing pleased him more than to find himself once more in the company of his Parisian friends. "Si par hazard il y avait des dates" (writes M. Pellechet) "sur ses beaux et nombreux dessins, on pourrait facilement reconstituer ses voyages." His portfolios are his itinerary: Palermo, Girgenti, Taormina are laid under liberal contribution, with MM. Vaudremer and Hardy, associates of

the long delightful days. With the latter he passed a month at Pompeii, and revelled in the beauties of the coast scenery at Castellamare, Salerno and Amalfi. In the intervals between these repeated foreign expeditions (for in 1858 his dated work records that he was engaged on the architecture of the chief cities of Germany) his father's professional career being closed, and but little business finding its way into his own office, young Cockerell availed himself freely and with thorough enjoyment of his *entrée* into the fashionable world.

Cockerell's first independent professional work was done in 1858-59, consisting of a cemetery chapel and other buildings at the picturesque little town of Ledbury, which, giving satisfaction to the townspeople, led to his building one or two small houses in the neighbourhood. His speciality came to be the design of country houses and the alteration and improvement of existing ones; and one of his earliest successes was achieved in raising the elevation and making additions to Coleorton Hall, the beautiful seat of his cousin Sir George Beaumont, which materially improved the proportion and dignity of that somewhat bizarre work of Dance. Among the more important of the many houses, which, throughout the English counties bear silent testimony to his skill in plan and grace of execution, are Down Hall, Essex (Sir H. Selwin-Ibbetson, Bart., M.P.) in the Italian style, where an excellent effect is produced by the use of concrete with decorative panels in sgraffito; Lythe Hill, Haslemere (J. Stewart Hodgson); and one of the most recent, Crawley Court, near Winchester. This is a large and imposing work, its idea a modified Elizabethan, its material brick and the grey flint of the country, with terra-cotta introduced into the window mullions, the whole effect being very light and soft. There were difficulties here connected with the site: some exceptionally fine tall trees stood in close proximity, and it was feared that any building short of being colossal would be dwarfed by them; but Cockerell managed his elevation with such judgment that the house, without being immoderately large, seems to reign duly supreme and asserts itself a successful rival to its lofty surroundings. One undeniable merit attaches to his residential buildings, the more remarkable as it indicates a feeling apart from his delight in the beauties of proportion and decorative work. If Mr. Kennard's mansion of Crawley be specially instanced, it is because it was Cockerell's largest and (with the exception of Woodcote, the seat of C. C. Cotes, M.P.) his latest completed work, and because its owner's comparatively recent acquaintance with his architect led to a strong personal friendship from his admiration of the conscientiousness and skill by which the fulfilment of his own wishes and requirements were combined with unyielding assertion of artistic principles and effect. Cockerell was always especially studious of the *genius loci* where he was called upon to build. Whether a modest rectory or a stately manorial residence were in contemplation, Nature was always duly courted in council over the projected site, its facilities and beauties harmonized with the invasion of its domain, and every less attractive feature softened by careful study and subdued. The Carlisle Memorial Column, at Castle Howard, testifies to his capacity for taking advantage of a fine position to atone for a limited expenditure by the exercise of appropriate taste; and a column in the beautiful park of Sir R. Bateson Harvey at Langley has been admired for its correctness of dimension and beauty of design.

He had little opportunity in the Metropolis of displaying his powers: a slight but pleasing memento exists in the front and entrance to the gallery of the Society of Painters in Water-colours in Pall-mall, and he executed a few private houses; but his only work of importance

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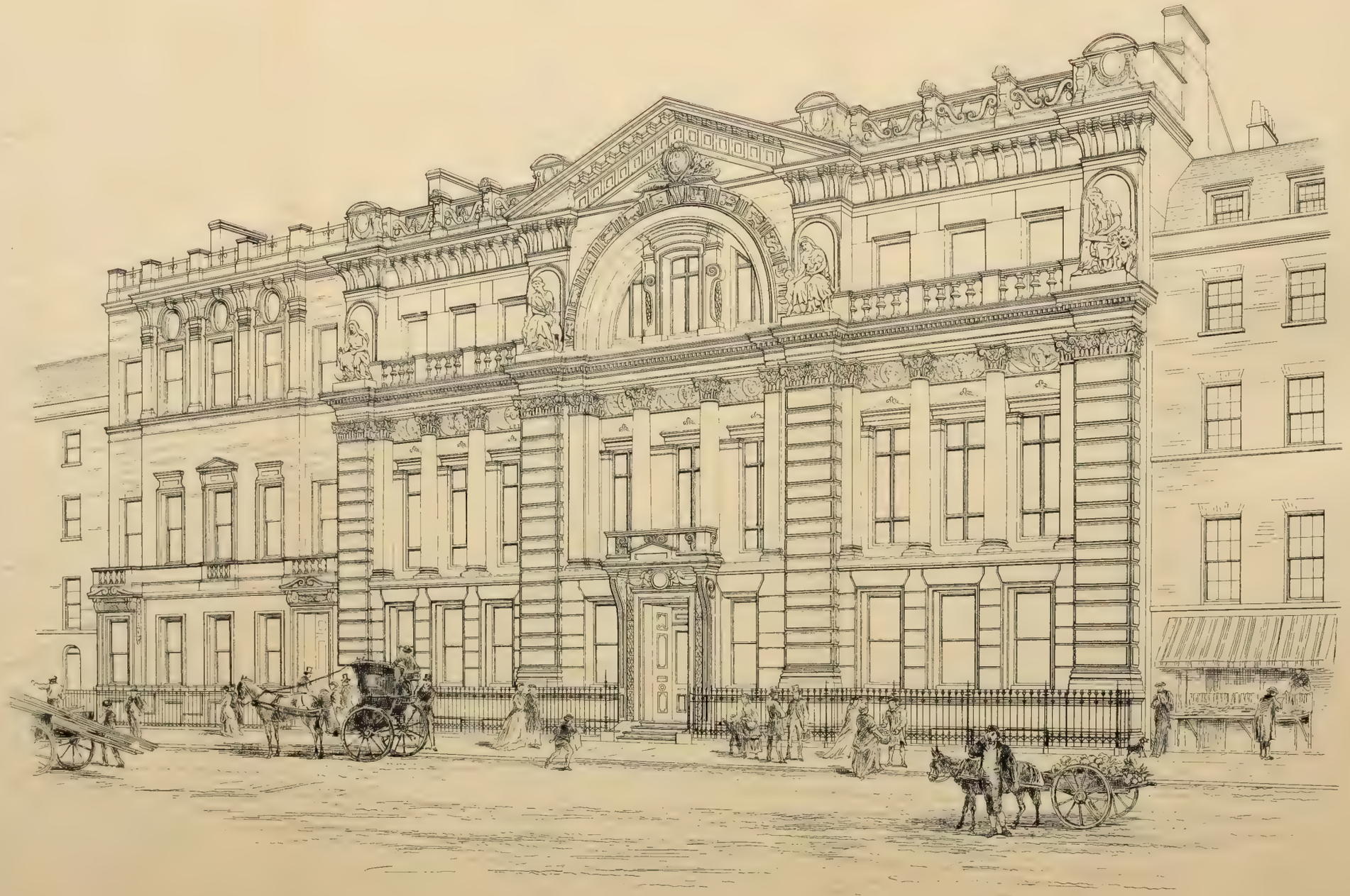

THE FREEMASONS HALL, LONDON.

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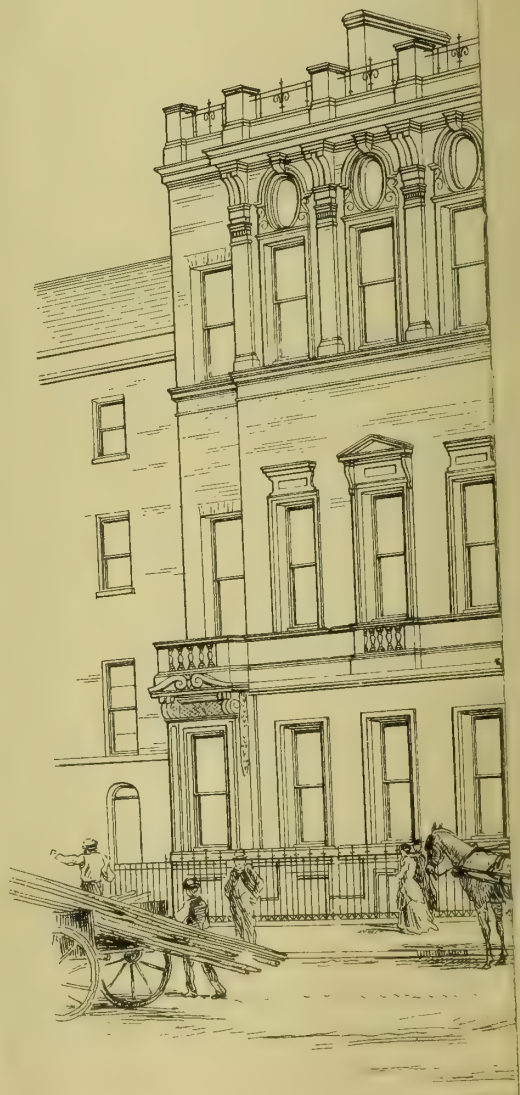

in London is Freemasons' Hall, for which his designs were selected in competition, (1864). It is marked by his distinguishing characteristics, originality and beauty of detail; the façade is rich in emblematic carving and sculpture. The highest recognition of the success within the power of the craft to bestow was shown by their architect's immediate appointment to the high office of Grand Superintendent of Works, which, although one subject to annual change, he continued to hold to his death, when, in his own Lodge where he had been greatly esteemed, the unusual tribute of three months Masonic mourning was paid to his memory.

A reflection will occur to all who criticized in his company or conversed with him upon the works of bygone days or of those of contemporary architects: he was unusually liberal of appreciation in Art. It was, for instance, impossible for anyone to be more free from bigotry in favour of the classical or the mediæval school or any special development of either. With the former naturally enough his name was in early days hereditarily linked, but his sense of the beauties of the latter, in their proper association, was manifest in the reverent care with which he always approached the restoration or enlargement of old buildings; and his School Library and Chapel at Highgate have been approved by men whose own successes in that style give value to their opinion. But Frederick Cockerell regarded style as altogether second in importance to the great principles which underlie all beauty, and which his power of analysis enabled him in every work of merit to distinguish and to prize. Eminently catholic in æsthetics, from a naturally acute perception of beautiful things and the effect of early education, his sweetness of disposition and utter freedom from any spirit of captious detraction robbed even the most condign disapproval of offence, so that those of his younger associates who sought his judgment found in the critic the friendly teacher too.

It is no aim of this brief notice of a lost friend to argue or insist upon the merits of his executed work; his own modest sense and distrust of sentimental appraisement would most earnestly have deprecated such a venture. Let the votive tablet be rather dedicated to those graces of mind and capacities of heart which distinguished him living and endear him dead. M. Douillard relates the following instance of his generosity:—He had commended to Cockerell's care, some fifteen years ago, one of his pupils whom poverty compelled to join his widowed mother, then settled on very slender means in this country. The young man was consumptive, and his frail tenure of existence was imperilled by the severities of the English winter. This circumstance made it difficult, to many it would have seemed hopeless, to assist him. But Cockerell's was not the spirit that could dishonour such a draft upon his benevolence; he sent his protégé to Pompeii for the winter, undertaking the disposal of his drawings. That he was himself the purchaser may be imagined by any whose charity has experience of such self-imposed commissions; but the plan so far succeeded that the young Frenchman was enabled by it to earn a maintenance for the remainder of his fragile life. Some of his drawings were dispersed at the recent sale of his kind friend's library—they bore the name of Clairvaux.

The story of Cockerell's youth has chiefly occupied the pen in accounting for the affectionate esteem which enshrines his memory. For in fact the colouring of youth pervades the retrospect of all his days; the outline many will fill in with pleasant thoughts. The simplicity, the playfulness, the energy of his early life were the adornment of its maturity. On the very morning of his death, deploring in conversation with a friend the prevalent depression as fettering the advancement of many young and able colleagues, "I have no right

to complain," he said, "for I have perfect health and never know fatigue;" but in half an hour he was no more. To be so suddenly cut off in the plenitude of strength, and ignorant of the sufferings of decay and of the thwarted aims and secret regrets that burden many deathbeds—such an end is not of those which are the most tragic in the world's experiences. It is the close that poets have called blessed to a life of intellect and action—if death could but in mercy touch only the one brave heart whose pulse it stills! Indeed, Frederick Cockerell's home life had been supremely bright; he married in 1867 a daughter of Thomas Homan Mulock, of Bellair, King's County, and the oneness of her every feeling and interest with his own combined with the tender graces of fair children to form for him a crown of happiness. His eldest boy was destined to his father's profession; and, should the tryst be kept when so much example and guardianship are gone, his father's friends will welcome him and show that there is such a thing as keeping a remembrance in the heart.

*** The Secretaries have been requested to add the following note from Charles F. Hayward, F.S.A., *Fellow* (sometime Honorary Secretary):—

"I would call attention to the direction in style taken by the genius of Mr. F. P. Cockerell under the influences of in the first place his father, and in the second place the office of Mr. P. C. Hardwick, —resulting in those designs for country houses: Lythe Hill for example, which I venture to think is not only a distinct mark in artistic design but which gave promise of a further development, —by steady, earnest and thoughtful work devoid of any straining after effect or haphazard picturesqueness. I attribute this to the careful study which was the habit of the elder Cockerell, and which I personally noticed in helping with young Frederick more than twenty years ago to work out the last building executed by the Professor—The Insurance Office at Liverpool. It was often that the work of days or even weeks was abandoned to make way for some improved idea, the result of Mr. Cockerell's study at home in communication with his son Frederick. No trouble or expense to himself was ever spared to have the work worthily designed. I possess a sketch (given to me by him at the time) of one of Fred Cockerell's first designs for the Government offices, which shows much more than his finished drawings the extreme care with which he he thought out his design, as well his great skill with the brush whereby he was able to touch in upon the slightest pencil lines the complete effect intended, with figures, statuary and ornament complete. To the careful study of classical work under his father's eye there was superadded the Gothic influence of the time then quite as predominant at Mr. Hardwick's as elsewhere. Even the Academy had begun —so it was whispered among intending students—to admit the idea of a Gothic design for probationers. But Fred Cockerell, who never felt the full force of Gothic fire, and being still bound by the steady influence of high classical culture, was saved from many of the extravagances the pure Gothicists often fell into, and so produced works which may possibly be of more lasting value, as art work, than many more picturesque or piquant designs. At any rate it is worth while pausing to think over the short career of such an artist, and, with the remembrance of the shifting tastes and influences of the period in which he lived, endeavour to judge our own work by that of one who has finished his course—kept the faith and attained the crown."

DISCUSSION.

CHARLES BARRY, F.S.A., *Ex-President.*—I have been called upon by the Chairman to tender the thanks of this Meeting to the writer of the eloquent Paper we have heard, which must have touched other hearts as it has mine. The writer desires that his name shall be unannounced, and there appears to me a strange propriety in this because he has, in the Paper, spoken the sentiments not of his individual self alone, but of us all; and we can sympathize entirely with every sentiment and every word that we have heard as though we ourselves had been speaking from our own knowledge of him who is gone. Lament for him I think we cannot. Lament for ourselves of course we must, but just as a mother treasures up bright ideas from her unconscious infant of the future man of intellect and talent, so, from the comparative child's career of our lost friend, we might have augured, and I think we do all believe, that, had it been according to the providence of God to have spared him to a green old age, every promise, every hope, every aspiration which affection could desire and which wisdom could promote, would have been fully and entirely satisfied. He is to be almost congratulated, if such a word can be used under such circumstances, in leaving amongst us a memory unmixed with envy. His career was not sufficiently developed in the strife of professional life to excite unkindly criticism or jealousy; only a memory of the kindliest sort can ever surround the name of Fred Cockerell. But one short year has passed since we saw him here amongst us, rejoicing in the advance making, as he believed, in the public esteem of our profession, in which this Institute has had no mean share, and in which he willingly took a labouring oar with his colleagues. It is given to us all I think to take a certain amount of pride in the work, though individually it is of course very little, that each is able to do for the advancement of the society in which we live, and in advancing the profession to which we are all devoted. That gratification our lost friend had. He knew the esteem in which he was held; he could not but know the good work that he had done. He had reason to believe that it would leave an excellent impression behind him, as indeed it has done; and in all these considerations his memory is a happy one. Some allusion, and a very touching allusion, was made in the Paper to his, at one time, idea and desire to become a painter rather than an architect. Many of us, I am sure, have in our younger days shared that feeling. Many of us, too, have felt delight and extreme gratification in the fields of imagination to which our studies lead us, and have experienced a feeling of shrinking from the prosaic paths of business and dry science with which the art of architecture must of course be inseparably connected; but it is just that feeling of appreciation of art, and indulgence in the imagination, which is one of the true characteristics of a real architect, affording a recompense for the toil and the routine of the business part of our lives. I think the profession of an architect would have little or no attraction for many of the men I see around me if with the strict exactitude of science and the requirements of daily life, and the necessity of strict exactitude in business and attending to pecuniary exigencies, were not mixed the opportunity occasionally of indulging in the imagination with which each may individually be gifted. I should be very

sorry indeed to think that in our professional work one faculty was divorced from the other. Another fact, mentioned by the writer of the Paper, refers to a feeling which I think we can share with our lost friend, and that is the disappointment he felt when he first entered Rome. I can remember that that was my feeling, and I can quite remember the involuntary exclamation—Is this Rome?—the Rome of my dreams, my admiration, my desire to see—this dirty, miserable, wet, squalid-looking street—Is this the Corso? But like Cockerell, three, four, six months residence in the Eternal City dispelled all that disappointment, and the desire to return, nay the determination to return, dated from the day of my departure. In my case very many years elapsed before that desire happened to be gratified. The intense pleasure of revisiting Rome, when an architect can go back to it with matured taste and greater knowledge of what he really wants to know, and greater power of learning than he had in his student days, is really beyond description. I hope I have not trespassed too long upon your time in making these remarks, prompted as they are by personal feelings, and, I am sure, entirely coincided in by many of those around me.

Charles L. Eastlake, *Fellow* (late Secretary).—The brief but faithful memoir which has been read this evening is one of deep interest to me, for many reasons which may easily be guessed. I enjoyed our late colleague's friendship for more than twenty years. Indeed it was while I was a pupil in Mr. Hardwick's office, which he entered for a year or so to complete his studies, that I first made his acquaintance. We attended Professor Donaldson's lectures together, and I think became students of the Royal Academy about the same time. There are no doubt some members of this Institute present who remember him in those early days, and I am sure they will agree with me when I say that in the youthful coterie, to which we then belonged, there was not a brighter spirit, a kindlier heart or a more accomplished hand, than that of Fred Cockerell. The accident of Mr. Cockerell's family connections gave him, while still a young man, an *entrée* into the world of fashion, where his brilliant social qualities and his engaging manners, no less than his artistic ability and highly cultivated taste, soon made him a general favourite. But although in such society he was the gayest of the gay, the popularity which he then enjoyed, and which might have turned the heads of weaker men, did not make him vain or indolent. He possessed that happy faculty which distinguishes some professional men, of being able to work and play by turns, and he did both with equal zest. Behind that easy nonchalant air which he sometimes assumed, there was in reality a deep and earnest devotion to his art and a capacity for taking pains which was very remarkable. He was rarely satisfied with his own designs, and his artistic aim was, probably, often beyond what he succeeded in realizing. One of his early characteristics made a great impression on me when a boy. I mean the intense filial respect and devotion which he felt for his father, who in his turn was equally proud of his son. Indeed it was delightful to see the two men together and to note the love and confidence which existed between them. Manly and straightforward in the expression of his opinions—upright and honourable in his professional career—with a supreme contempt for all that savours of bigotry and affection in the practice of his art, Cockerell was, to my mind, and I am sure in the opinion of most who hear me, admirably qualified for his position as Honorary Secretary to this Institute; and I can truly say that during the seven or eight years in which we held office together—a period of uninterrupted cordiality between us—I never sought his advice in vain, and that advice

always seemed to be dictated by a sound and an accurate judgment. Of his professional works, I, who am now altogether outside the profession, will leave others to speak, contenting myself with this brief but sincere tribute of respect to the memory of a dear friend and former colleague.

GEORGE AITCHISON, B.A., *Fellow.*—"Those whom the gods love die young:" can we therefore regret for Cockerell, that he was cut off in the plenitude of health, of youth, of happiness and success? But for ourselves as architects, as Londoners, as Englishmen, I think it is a great misfortune. Fred Cockerell was to the architects what the present President of the Royal Academy is to the painters: he was the most accomplished and polished gentleman amongst us. No man ever passed an hour in his company without feeling that he was in the best society; and his look always reminded me of one of the great kings of France. As far as architects go, Fred Cockerell was the representative of the great men of the Renaissance; he was young with a child-like simplicity, with vigour of mind and power of enjoyment. He was many-sided like a cut crystal, from each facet of which as it swings the sun flashes. There was no side on which you could attack him that he was not fully equipped, and from which there was not a sort of lightning flash of genius. He could criticize the works of novelists and poets, the works of art of the ancients, or of our own distinguished painters and sculptors. In the journeys many of us have made in his company, no one ever delighted us more than he, when he descanted on the charms of the landscape or the particular qualities of some of the buildings, the paintings, or the sculpture we had before us. I cannot help thinking that, for an architect, this appreciation of everything beautiful, combined with his power of figure drawing and figure composition, was almost unique. No man, however brilliant his intellect, without Fred's trained eye and hand, could do the things he has done, and I most deeply regret that he was cut off in his prime, before he had the chance of adorning London and his country with some fine public buildings.

HORACE JONES, *Vice-President.*—As the oldest member of a small coterie of architects who for twenty years have been in the habit of friendly and brotherly intercourse, I feel it difficult not to attempt to add on behalf of those who are left with myself one word in tribute of our respect, esteem and love for our lost friend. Another one went before him, Digby Wyatt, well loved, well revered, well respected—and to our deep regret, though we know that they must go. Poor Fred has now gone too; he was one whose high intellectual qualities we must all look back to, and whose cheery, honest English character we must all remember with affectionate regard.

The CHAIRMAN (T. HAYTER LEWIS, F.S.A., *Vice-President*).—I think that few can feel much more than I do the very touching way in which this memoir of poor Cockerell has been written. Like most of you I knew Cockerell well. I have worked with him for many years and can bear cordial witness to his artistic, elevated and enthusiastic feeling in conversing upon all points connected with art. The sketches which adorn these walls may give you some notion of what his talents as a painter might have been, and in thinking of that passage in his life in which his inclination towards the study of painting instead of architecture is described, I cannot help being reminded of a somewhat kindred feeling in that famous architect, Inigo Jones. The actual change, the well-known words are recorded by Horace Walpole when he says, relative to Inigo's journey to Italy: "He threw down the pencil and conceived Whitehall;"

he changed from his first vocation of a painter to become the world-renowned architect whom we know. I can perfectly understand the feeling with which one calls to mind the associations of early life in such a place as Rome, and of one's early companions there. The writer of the Memoir speaks of the Via Felice. I call to mind another street not far off in which a number of our friends, many of whom are now passed away, formed a coterie certainly to our own pleasure, and by rubbing together kindred minds, no doubt, also to all our edification. One can quite understand also the feeling of coming back from such an association, where everything is *couleur de rose*, and then settling down to a profession which requires much hard study and hard work, and in which there is a great deal that is not always quite *couleur de rose*. Cockerell's example points out well that one ought not to be disheartened by a feeling of that kind. It is the same with other professions. A young man comes from the university and settles down in a barrister's or solicitor's office, and he has just the same hard commonplace work as we have, so utterly different from the imaginative work to which he has been used. There is a sort of humiliating difference between the two; but it is our duty, and we must do it. Cockerell did it, and not only did his duty towards his clients, as he was bound to do it, but towards us outside the strict work of his profession, for he devoted to this Institute a large amount of his time. One may perhaps often feel acutely enough the old saying which Mr. Aitchison quotes: "Those whom the gods love die young." But the happiness thus hinted at is for the lost, not for those whom they leave behind; to them is left a deep vacancy, keenly felt at first and ever difficult to fill up.

The Vote of Thanks, seconded by Mr. Eastlake, to the author of the Paper, having been put from the Chair, was passed by acclamation.

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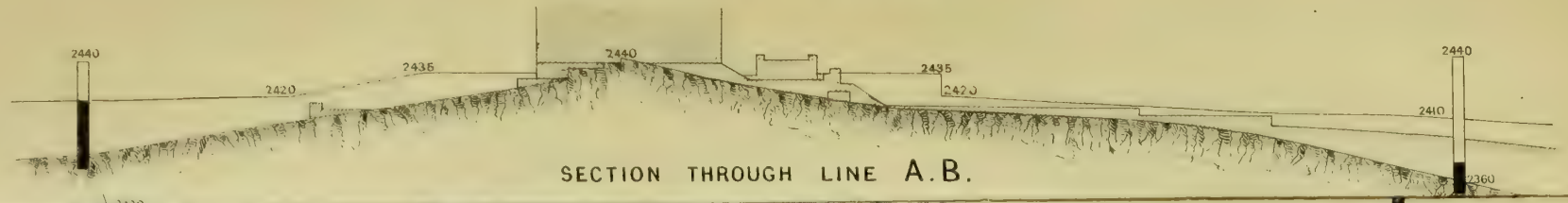
HARAM ES SHERIF.



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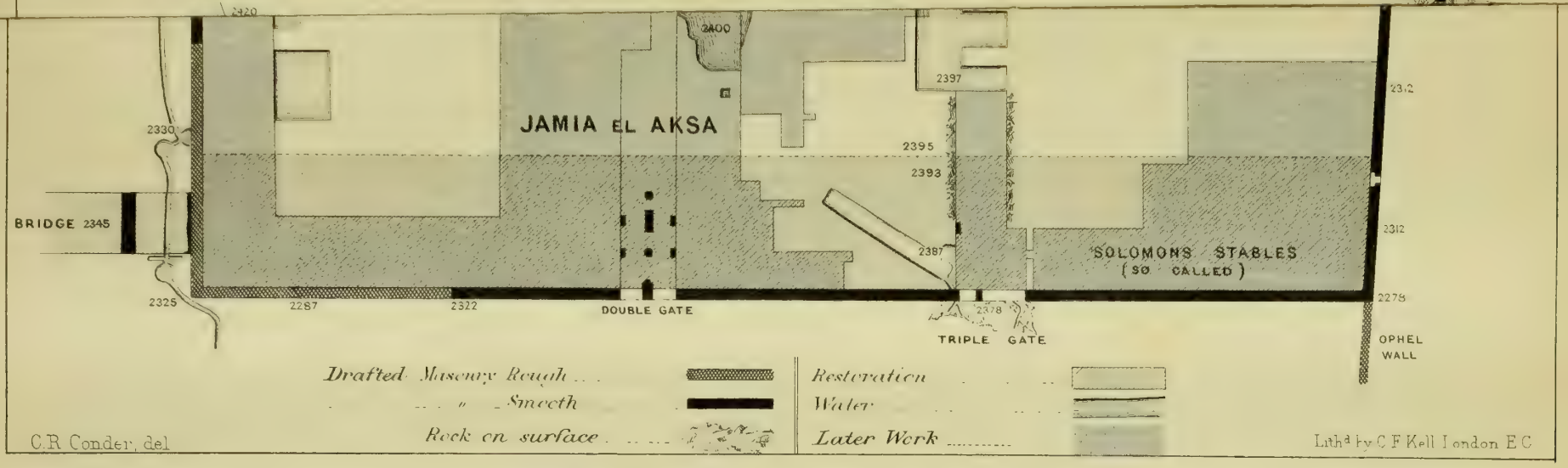

Drafted Masonry Rough . . .
" " *Smooth* . . .
Rock on surface . . . . . .

Restoration . . . . . .
Water . . . . . .
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C.R Conder, del

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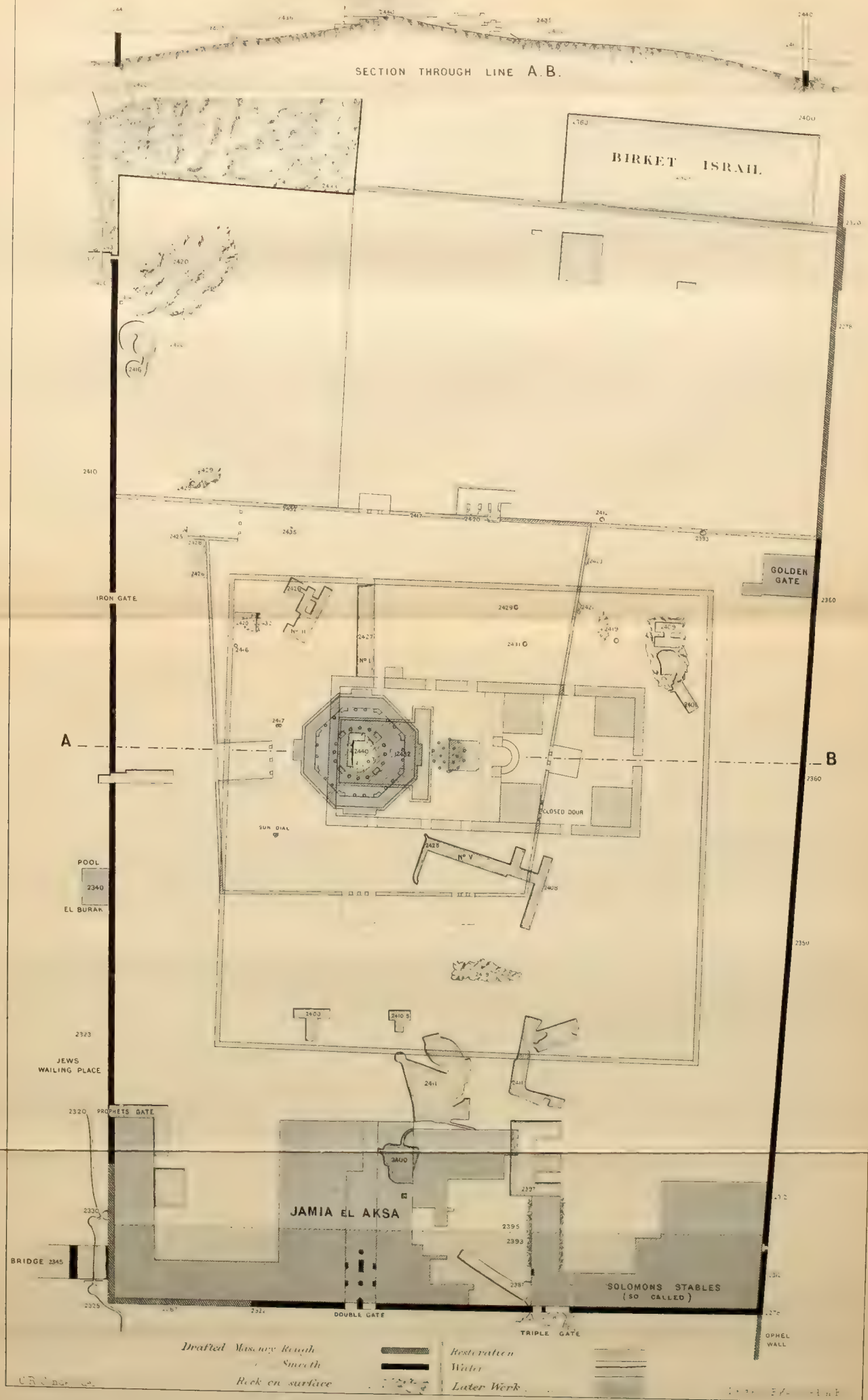
HARAM ES SHERIF.



The only other work in the Dome of the Rock belonging to an early date is the beautiful glass mosaic on the screen. It can hardly be doubted that the arabesque designs and Cufic inscription are of one date, judging from the colour and general appearance. That date according to the inscription is 72 A.H. or 688 A.D. The designs on the mosaic are entirely conventional, resembling somewhat those in the dome of the Aksah, which is dated 728 A.D., or 40 years later. The absence of figures in the design is significant, for the old Christian mosaics in the Damascus Mosque are almost entirely devoted to figure subjects, and the same is found to be the case in the Crusading glass mosaics at Bethlehem.

Such is a plain account of the principal details of the *Kubbet es Sakhrah*. There appears to be nothing in the building of distinctly Byzantine character beyond the pillars with their blocks above them, or at least if there is I have failed to gather from Mr. Fergusson's works what that detail is. The pillars appear to have been taken from an older building or buildings, and the habit of so collecting columns of very varied design has been commonly adopted by the Arabs from a very early period. Such pilfered columns are found not only at Jerusalem but at Cairo, and at Acre, at Damascus, and at Gaza, in fact wherever old material was available. That this use of old material was a common practice of Byzantine architects seems on the other hand unlikely, and at least, in the case of Constantine's Basilica at Bethlehem, the pillar-shafts, bases, and capitals are of uniform character.

It is for architects to judge whether the above-mentioned facts are at all conclusive as to the claims of the building to Arab origin, and whether the preceding comparisons are sound in principle. If we would know what was the form and style of Constantine's Jerusalem Basilica we should surely study the Basilica he built at Bethlehem. If we wish to ascertain the date of the Byzantine architecture of the Golden Gate it seems preferable to refer to Syrian rather than to European types. If we would arrive at a conclusion as to the date and style of the Dome of the Rock, it is at least only fair to enquire whether it has anything in common with the Dome of the Chain which Arab historians state to have been the model from which it was designed. The subject is almost inexhaustible, and when one has wandered day by day in the great area, descending into the damp rock tunnels, or entering into the purple gloom of the Chapel of the Rock, watching the countless doves which hover over the dome or crowd in the beautiful honeycombs of the great gateway roof, interest grows ever greater in the beautiful and wonderful enclosure. Much has been done to throw light on the origin of the various buildings. So much that very unreasonable expectations have been raised and impossibilities have been demanded of explorers. Much still remains to be done, especially beneath the flagging of the platform, but it is to be remembered that the High Sanctuary is the second sacred enclosure of the Moslems, inferior only to the Kaabah, and that excavation within the area is regarded by them much in the same light in which we should regard proposed excavations in the choir of Westminster. It is only by patient study and by occasional opportunities that further information can be obtained, and that facts will gradually take the place of conflicting theories.

DISCUSSION.

JAMES FERGUSSON, F.R.S., *Past Vice-President.*—I rise with considerable reluctance to attempt to reply to the Paper just read by Lieut. Conder, not that I feel the least difficulty in answering all the objections he raises to my views, but that they are brought forward in such a form as to render it extremely difficult to follow the reasoning on which they are based.

I have myself frequently intended to bring the subject before the Institute, but have always been deterred by its extreme complexity. There are so many authorities to be sifted, so many plans and diagrams to be drawn in order to make it intelligible, and so many collateral illustrations to be adduced, that I have always felt that to attempt this before an audience not specially interested in, or familiar with, the subject, would be labour in vain. I have consequently thought it better to write a book, in which all these things could be brought forward, with all the necessary references to authorities, in such a manner that any student might at leisure, with books and drawing-board by his side, master the whole much more satisfactorily than in listening to a single lecture on so complicated a subject. All this has been done in my "Temples of the Jews, and other buildings, in the Haram and at Jerusalem," a volume of 300 quarto pages of text, with nine plates and fifty-two woodcuts. To answer the Paper you have just heard, I would like to read you my book from the beginning to the end, but this you would hardly stand, and I must content myself with such explanations of it as the time remaining of this meeting will admit.

If I felt that I could not, with all the illustrations and appliances at my command, make my views intelligible in a single night, even if I confined myself to the Temple only, it is hardly to be expected that Lieut. Conder could make not only his, but mine also, intelligible in a Paper, with very scant diagrams and without a single reference to authorities, while ranging over not only the Jewish, but the Christian and Saracenic buildings in the Haram area.

Although it is not expressly so stated in so many words, it is quite evident from the context that this Paper is, from the first line to the last, intended as a refutation of certain heresies of which I am accused regarding the topography of Jerusalem. His theory of the site of the Temple and its area is not, as I understand it, put forward as a serious scheme, and certainly is not worked out either with the detail, or the references to authorities, that could command acceptance from others. As he himself states (p. 32) it is put forward as a "theory or hypothesis indicating the direction in which we should work;" the advantage of introducing such things here being that if anything can be said in their favour, it is so much argued against my views—as it is impossible both can be right—and *pro tanto* it aids the whole argument of the Paper. The objections to my views, however, are in this Paper stated in so indistinct a manner that it would even now be quite open to its author to say he had never seen or heard of my work above referred to, and his strictures referred to some previous publication of mine. Certain it is that the work is not once named in the Paper. My words are nowhere quoted, and no reference is made to the page or place where any statement is to be found, so that, though I may guess what is intended, no one else can be sure. More than this, I have no hesitation in asserting that a full and detailed answer, with all the requisite illustrations and references, will be found, in my work, to every one of the objections raised to my views in this Paper. Whether these are logical and satisfactory others must determine. To me they appear completely so; but however this may be, it is not a sufficient reply simply to ignore them, as is done in this

Paper throughout. So completely is this the case that, had this Paper appeared anywhere else, I probably would not have thought it necessary to reply to it, but coming in so formal a manner before the Institute, I feel it incumbent on me to offer such remarks as the limited time at my disposal will admit of, though this will be hardly more than sufficient to enter a protest against its assertions.

In the first place I must be allowed to object *in limine* to anyone being allowed to put forward any scheme for restoring the Holy House without first having worked through all the indications regarding the Temples of the Jews to be found in the Bible. It has been too much the fashion to neglect these as indistinct and unintelligible, and to trust more to the assertions of the Talmud, which certainly are distinct enough, but in almost all cases can be proved to be erroneous, or erroneously applied, from the ignorance of the Rabbis of the real form of the building they were talking about. I have gone over the passages in the Bible referring to the Temple, not only once, but several times, and always with an increasing conviction that, with the knowledge we derive from other sources, they are sufficient to fix the position and dimensions of the temples of the Jews within the narrowest possible limits. I may say, we now know that the dimensions of the Courts of Solomon's Temple were 300 cubits east and west by 100 cubits north and south. The temple Ezekiel describes in his vision was of the same dimensions, though he complicates the matter by adding a north and south court, making it 300 cubits in that direction also. We know from the description of Hecateus of Abdera, who saw it in the time of Alexander the Great, that the Temple, as rebuilt after the return from the Captivity, was of these dimensions, five plethra (500 feet) east and west by 100 cubits in the other direction, and when we come to protract the biblical measurements on the Ordnance Survey, combined with what we learn from Josephus and the Talmud, we find that, from the inner side of the wall of Solomon's porch—the site of which is perfectly well known—to the inner side of the wall at the back of the court of the Holy House, it measures 300 cubits—450 feet—neither more nor less.

It is of course impossible for me to enter at present into the details, though they will all be found in my work above referred to, and I must consequently content myself by stating broadly that I have embodied all the indications found in the Bible, combined with all the measurements furnished by Josephus and the Talmud, in a plan of the Temple which forms plate No. II of my work, which was drawn on the large plan of the Ordnance Survey. Having done this I find the whole so consentaneous, and to fit so well together, that I would now undertake to draw a circle with a foot radius, or the pavement of the Haram area, which should mark the centre of the Jewish altar, within its limits, and another further west, which should mark the centre of the Holy of Holies within the same limits of deviation. Having fixed these two points, and the external dimension being fixed by the Ordnance Survey (as will presently be shown), I assert that there is not one dimension or one feature in the plan of the Temple which may not be fixed within the limits of a cubit or two at the utmost. There may be some details of the chambers and minor features which require further consideration, and the elevation may be open to criticism, owing to the scant materials for reconstructing it; but in so far as the plan and general outside dimensions are concerned, I have no hesitation in saying that there is no building in antiquity of the same extent and complication whose plan and arrangements can be made out with the same certainty. There may be errors of arithmetic or of typography in my work, but, barring such, I challenge the exposure of any error beyond the limits, above indicated, in my plan of the Temple of Jerusalem as rebuilt by Herod. I need hardly add that no such criticism has yet been attempted, nor probably will be soon, as requiring more care and attention than it is usual to bestow on such subjects.

Without attempting this, and indeed without referring to any of my plans, Lieut. Conder resumes the argument by enumerating six objections which he considers quite fatal to my theory of

the Temple of the Jews. As these are really the most important points in his Paper perhaps you will allow me to state as briefly as I can why I think them irrelevant.

No. 1.—"The south wall of the Haram, as above shown, is 922 feet in length, and the master course runs unbroken beyond the limit proposed by Mr. Fergusson."

When I first wrote on the subject ("Topography of Jerusalem, 1847," p. 8), I was content to state that the Stoa Basilica could not extend beyond 600 feet from the south-west angle of the Haram, from which point Lieut. Conder and everyone else admits that it began, because there was nothing beyond for it to stand upon. Finding that this was overlooked, in 1860 I published a diagram in Smith's "Dictionary of the Bible" to show how impossible it was. This answered its purpose for a certain time, but in 1875, in the *Athenæum* journal (June and July), Captain Warren challenged me to show why it should not extend to the south-east angle. I answered, firstly, that 40 columns extended over 922 feet would require epistylia 24 feet in length, and none such existed in the ancient world; and, secondly, that beyond those 600 feet there was nothing but what he afterwards called "weak arches of the Byzantine period" ("Underground Jerusalem," pp. 347, 325). After shifting his ground once or twice he turned to personal abuse and so closed the correspondence, and I thought I had done with him, and am surprised that the question should again be brought forward. If Lieut. Conder will only draw a plan and section of these vaults with the Stoa over them, he will, I feel, be convinced that it is impossible it did extend over them.

Besides, this extending the Temple to the south-east angle leaves no room for Solomon's palace, which, I believe, undoubtedly existed in that corner. Plan No. 1 of my work, with the accompanying text, proves this, to my mind, beyond all dispute; but if I am wrong, say so; and say where the error lies. Simply ignoring my statements and plans is no answer. Till it is shown to be otherwise, I assert that the Triple Gateway stands on the site of the Horse Gate of Solomon's palace where Athaliah was slain (2 Kings xi. 19), and the corner tower was "the Great Tower by the wall of Ophel, which the Tekoites repaired." The corresponding "tower by the Court of the Prison" was 600 feet further north and marked the north-east angle of the king's high house (Nehemiah iii. 25 to 27). All this seems so clear and certain, that till the error is pointed out, I must be allowed to assume it as a fact.

When some one will explain what the "master course" means, and whether it was put there by Solomon, or Herod, or Justinian, I will state whether I agree with him or not. It does not at present appear to me to have any bearing on the question; but if I were asked to guess, I should say it was part of Justinian's repairs, as all the work above it certainly is.

No. 2.—"The junction of the Ophel wall with the south-east angle also points to the east wall of the Haram as being the old east wall of the Temple, and the Double and Triple Gates correspond to the two Huldah, or 'mole-gates,' of the Temple, according to the Talmud."

This objection is fully answered in the preceding paragraphs, and I could therefore only remark that the Huldah Gateway under the Mosque El-Aksah is double, and as such fully answers to the description given of it by Josephus (Ant. xi. 5) and the Talmud so far as I know it; though, as Lieut. Conder gives no reference, I do not feel sure. But, from all I know, I feel certain that the assumption that there were two separate entrances, at some distance from one another, is wholly gratuitous, and unsupported by any fact within my knowledge.

Nos. 3 and 4.—"The north-west corner of Mr. Fergusson's enclosure is placed where the rock is 100 feet lower than the Sakhrah; thus there is no possibility of the existence of a rock scarp at this point, such as is required for the site of Antonia. Foundations would, on Mr. Fergusson's hypothesis, be required for the Holy of Holies, which would be from 60 to 90 feet deep, in order to give to the floor of the Temple the requisite elevation (as given in the Talmud) above the outer court."

Objections 3 and 4 may as well be taken together, as they refer to matters of which neither Lieut. Conder nor I have any real knowledge. On this subject, however, I may be allowed to remark that both Capt. Warren and Lieut. Conder have done immense injury to the correct topography of Jerusalem, by publishing imaginary contours of the rock surfaces at Jerusalem at depths which neither they nor any one else saw, or ever could have seen them. Captain Warren's contoured plan of the Haram area ("Recovery of Jerusalem," p. 298), is one of the most misleading documents ever published, being based wholly on imaginary surfaces he never saw; and Lieutenant Conder's statement that the rock was from 60 to 90 feet below the Holy of Holies is in itself sufficient to show how little is really known. So far as I can make out, and I believe I may state that Major Wilson entirely agrees with me in this: the rock rises gradually though irregularly from the valley of Jehosaphat to a ridge terminating westward in something very like a cliff, where I believe the tower Antonia to have been, and just behind the Holy of Holies of the Temple, where I place it.

Where the altar stood, the rock—as can be seen from the roof of the "Great Sea"—rises almost to the surface; and I see no reason for supposing that it is many feet below where the Holy of Holies stood, 6 or 9, I believe, would be nearer the mark than 60 to 90: but even if it did, all that can be said is, that Solomon raised the foundations of his Temple in the same manner and from the same depth that Herod afterwards accomplished. No further argument can be based upon it; and that may safely be disregarded, in comparison with the mass of evidence for fixing it where I have done.

In like manner, if there was a drop of 100 feet in the 400 feet which extend from the Dome of the Rock to where it was next seen under Wilson's arch, the probability is, that there would be a cliff of 50 feet in height, somewhere on which the "Turris Antonia" might be placed. But till we really know where the rock is, these are idle speculations; and I do not profess to be able to see further through the solid earth than my neighbours.

No. 5.—"There are no remains of ancient rampart walls on the lines where Mr. Fergusson draws the north and east boundaries of the Temple."

If my views are correct, the facts are the exact reverse of this. At a distance of exactly 600 feet from the south wall, and perfectly parallel to it, is a wall 10 to 15 feet in height, supporting the terrace of the upper platform. I believe that what we now see is the inner face of the north wall of Herod's temple; it extends 600 feet—or, more exactly, 585—from the west wall.

In like manner, if we measure 585 feet from the south-west angle, we come to the treble gateway, where the wall, here 40 feet in height, turns up at a right angle, still visible for some 200 feet in length, partly cut in the rock, partly in old masonry, though a good deal knocked about, till it loses itself in the mass apparently of Justinian substructures; but, if continued to a length of 600 feet, it would meet the north wall of the Temple at 585 feet from the western wall. We have, therefore, on the Ordnance Survey, a perfectly regular rectangle 600 feet by 585, perfectly level throughout, and in every way suited to receive and accommodate such a temple as that Herod built at Jerusalem. I need hardly add, there is no other spot in the Haram area, or anywhere else, where the Temple could be placed, with boundaries so well defined, and which, so far as I know, cannot be increased or diminished by a single foot without getting into difficulties which, so far as I am capable of forming an opinion, are absolutely insurmountable.

No. 6.—"The dimensions in the Talmud give an area considerably greater than the 600 feet square proposed by Mr. Fergusson."

The first answer to this is, that it is of the least possible consequence what the Rabbis said, when

contradicted by the evidence of the Bible, of Josephus—who is never wrong in plan, though frequently he exaggerates heights—and the Ordnance Survey, whose correctness no one disputes.

The second answer is, that the Talmudic dimensions are a mistaken quotation from Ezekiel, What that prophet said was (chap. xlii. 16 to 20) that the boundary wall of the Sanctuary—the Temple itself, as before stated, he makes only 300 cubits square—measures 500 reeds, or 3000 cubits each way. The Septuagint rightly considering this an improbable dimension for a temple, translated it cubits; and the Rabbis, adopting this as a sacred measure, gave it as the dimensions of the "Mountain of the House," but being unable to reconcile it with their other measurements for the holy places, put the 100 cubits so gained beyond the true 400 of Josephus, into the semi-sacred Court of the Women, where it is easily shown it was impossible. Generally the Rabbis are aware of the difficulty: some try to explain it, by saying that it means the smaller cubit of 15 inches, while they know and admit that Josephus used the Greek cubit of 18 Greek inches. The one they say means 600 feet, or one stadium, the other 625, which they consider as no material difference. Lieut. Conder's cubit of 16 inches—which I never heard of before—would make 666; but even 18 inches would only make 750, which is still far from 922 feet. But none of these hypotheses will bear a moment's examination, for reasons I have stated elsewhere, but which are too long to go into here. The truth of the matter is, the Talmud is a perfectly worthless authority, when its statements cannot be checked and authenticated from other sources, and in this instance is demonstrably wrong.

In concluding this part of the subject, allow me to state as distinctly as I can, the Temple of the Jews, as rebuilt by Herod, was a rectangle 600 feet by 585, situate in the south-west angle of the Haram area; and within that space it is easy to arrange all the buildings described by all the known authorities with exactness and consistency. Were it either larger or smaller, or were these two dimensions in the opposite direction, I believe it would be impossible to do so. The result is shown in plan No. II. of my "Temples of the Jews;" and I wait now for some one to point out any important or even appreciable error in the plan so drawn. I believe it will stand the most searching scrutiny; and certainly nothing in it, is invalidated in the slightest degree by any of the six objections brought forward by Lieut. Conder, to which I have just been replying. So long as the correctness of this plan remains unshaken, I must be allowed to consider the position and plan of the Temple as settled beyond dispute; and all reasoning with regard to it or to the other buildings in the Haram area must consequently be based on this plan as an established fact.

The second part of Lieut. Conder's Paper is a more direct attack on my theories than even the first, though he still leaves it doubtful which of my works on the subject he refers to, or whether he has ever seen the last. It is however a part of the subject which it is much more difficult to reply to, not only from its greater complexity, but also because the authorities on which any reasoning can be based are generally unknown to any ordinary English audience. Every one possesses a Bible, most possess a copy of Josephus, and many have access to the Middoth of the Talmud; and these nearly suffice to enable any one to form an opinion as to the correctness of any theory of the Temple. On the other hand, very few are familiar with the Byzantine historians, between Constantine and Justinian; fewer still are acquainted with the Arab writers on whom we must depend for our knowledge of the history of their buildings in the Haram. It is even rarer to find any one well read in the mediæval narratives collected and edited with such care by the late Titus Tobler. Under these circumstances, without the least desire or intention to mislead, it is manifestly impossible within the limits of a lecture to produce all the quotations and references necessary for forming a judgment on such a subject, and without them what is said can only be a mere string of assertions which must be taken on trust, as no means are afforded of verifying them. In my various works on this subject, I have

given the extracts and references and other data required for the elucidation of the argument, but so far as I know no one has ever read them. No one certainly has ever noticed them in print, though had any one done so, this controversy would long ago have been settled one way or another. As it is, it remains pretty much where it was when I took it up thirty years ago. Such being the case, I shall not now attempt to follow Lieut. Conder through all the various statements he makes in his Paper, but shall confine my remarks to such as present some novelty either as being the result of his own researches, or a new reading of passages already known.

Among the first, Lieut. Conder considers the Dome of the Rock could not have been built by Constantine, because the capitals and bases of the twelve columns supporting the inner drum of the Dome, which he was the first to draw with sufficient care, to make the fact obvious, are nearly all different. If I, or any one else, had ever asserted that the building was erected entirely of new materials this would be an argument no doubt, but it would have been quite contrary to the spirit and practice of the age, that it should be so. Anyone who knows anything of the buildings of Rome at that time knows that almost without exception, they are made up of materials torn from older buildings, and used in the most incongruous manner. Not to travel beyond our record. In the Lateran Baptistry, which Constantine erected as his own tomb house ("Temples of the Jews," W. C. 66), half the capitals are Corinthian, half are Ionic, and so in almost every Basilica or building of that age in Rome. At Bethlehem, where there were no remains, the capitals seem all original, but at Jerusalem, we know that Hadrian built at least one temple to Jupiter. We know that a temple to Venus stood over the *Sakhrah*, which had to be cleared away before the sacred Cave was disclosed (Eusebius, "Vita Constantini," III, 26 and 27), and no doubt there were many other temples and porticoes erected during the two centuries and a half, that Jerusalem was a flourishing Roman colony, and from some of them, these columns may have been taken. Had any of the capitals been later than the time of Constantine, it would have been an argument. Very many of those in the Aksah are of the time of Justinian or later, and prove that this building is after his time, and of a different age from the Dome of the Rock, where all the capitals are either of the time of Constantine or anterior to his age. This, as far as it goes, is a proof that though the Aksah is known to have been erected after Justinian's time, that the Dome of the Rock certainly belongs to a different and earlier age. I do not in fact believe that any architect can examine the drawings and photographs of these two buildings without perceiving and ackowledging this as a fact. If the Aksah was erected in the seventh century, the Dome of the Rock is certainly some centuries earlier.

Of the second class, one of the most startling novelties of Lieut. Conder's Paper, is his adoption of what always appeared to me a very silly conceit of Mejr-ed-din, an Arabic writer of the sixteenth century, that the Dome of the Chain had been erected by Abd-el-Malik as a model of the Dome of the Rock in order to judge of the effect before commencing the larger building. Any one, I fancy, familiar with Oriental literature, would see that this is just such a fable as an Oriental writer living eight centuries after the events would be sure to invent, to account for a certain similarity that existed between two buildings so near to one another, but of whose real history he knew absolutely nothing.

The adoption of this story, if it rested there, would be of the least possible consequence, but to found on it the theory, that the Dome of the Rock was originally erected without external walls, in spite of the recent discovery of the upper arcades, with their mosaics and all the features of Byzantine architecture recently disclosed, is one of the boldest flights of imagination of this class I am acquainted with. What we really do know of the Dome of the Chain is that during the Crusades, at all events, it was considered the tomb of James the Just, the brother of Jesus, and if my

view of matters is correct, nothing could appear more natural than that his tomb should be found in immediate proximity to that of his brother. But be this as it may, Theodoricus copied the following inscriptions from its walls. (See Tobler's edition, p. 42.)

Dic, lapis et fossa cujus sunt, quæ regis ossa,
Sunt Jacobi Justi. Jacet hic sub tegmine busti.

As is perfectly well known, the moment the Crusaders entered Jerusalem, in the year 1099, they seized on the Dome of the Rock, which they called "Templum Domini," in contra-distinction to the *Templum Salomonis*, which they knew was represented by the Aksah. That they desecrated and turned into a barrack for the Knights Templars: whence their name. On the rock, however, in the "Temple of our Lord" they erected a golden cross, and adorned it with precious marbles. A golden lamp hung over it and burned day and night during the eighty-eight years they possessed it; "Canons regular" were appointed to superintend constant services, and in every respect the Dome of the Rock was considered as sacred and as important a Christian edifice—whoever built it—as the *Sepulchrum Domini*, which then stood in the middle of the Christians' quarter of the town. There seem to be no means now of knowing exactly what they thought the rock and its appurtenances really were, nor do any of the Latin inscriptions in mosaic with which they adorned its walls both internally and externally clearly express this. Yet these inscriptions are important for our present purposes, as they prove incontestably that the Cufic inscriptions which now take their place, though so confidently relied upon by Lieut. Conder, are forgeries of the thirteenth century after the building was recovered by the Moslems under Saladin.

In the first place it is most improbable that the Crusaders should have allowed inscriptions in the writing of the Infidels and in praise of their false prophet—as they called him—to remain on the walls of their most sacred church. It will not do to say the people could not read them. Their doctors and learned men could, and even the character of the writing was an insult that all could appreciate. Besides this, however, we know that the building was covered inside and out with Latin inscriptions in the place where these Cufic inscriptions now are. These were copied by two independent witnesses, Theodoricus and John of Wurtzburg, and are quoted at sufficient length in my "Temples of the Jews" (pp. 220 *et seq.*).

I cannot of course attempt at this moment to go into the history of these mosaics, my reasons for believing them forgeries are given at length in my work just referred to (pp. 218 to 224), and to which those wanting further information on the subject are referred. The Latin and Cufic inscriptions are, however, of very great importance to the history of the building, and whether I am right or wrong regarding the latter being forgeries, it is not a fair mode of representing my case to ignore them altogether, and pass over in silence all I have said regarding them, as Lieut. Conder has done.

The subsequent history of the Dome of the Chain, in so far as I can make it out, is simply this. When the Mohamedans under Saladin resumed possession of the Dome of the Rock, they found themselves in possession of a building in which prayer was impossible according to the Moslem ritual, because the principal entrance was on the south, in the direction of Mecca, and though it was not absolutely indispensable it was convenient to have a place of prayer close at hand. So at least it has been found, in all the great Indian tombs which are similarly situated. They consequently converted the Tomb of St. James for this purpose, by providing a prayer niche on the south, which was all that was required to adapt it for a mosque, and it has been so used ever since. Who the original builder of the Dome of the Chain may have been I do not pretend to know, but that it was originally erected as the Tomb of St. James seems nearly certain, and if this was so, it certainly was not erected by Abd-el-Malek as a model, or for any other purpose.

A very few words will suffice to show that Lieut. Conder is entirely mistaken in stating that the Mosque el Aksah was originally the Mary Church of Justinian. It is one of those assertions which everyone repeats without thinking, and many will probably go on repeating in spite of any amount of refutation. Broadly the fact is this. The Aksah stands, even on Lieut. Conder's own showing, within the precincts of the accursed Temple of the Jews, and Justinian did not and could not build his church on a spot so utterly abhorred by the Christians. Without going into details everyone knows the history of Julian's abortive attempt to rebuild the Temple. So impious was this considered that all Christians of that day believed that it was stopped by miraculous interference from heaven, and anyone who will read the account given by Eutychius (A.D. 870) of the grant of this site to the Caliph Omar, after Justinian's death, will probably be convinced that it was then still held accursed. When Omar claimed, in accordance with the treaty, a place on which to build a mosque, the Patriarch Sophronius replied, "I give to the Commander of the Faithful a place where he may build a Temple, which the Grecian Emperors could not build" (alluding to Julian's attempt). He then goes on to describe the position of the Temple and its form, which must at that time have been perfectly well known, and the *Sakhrah* in the midst, which was certainly the "Lapis Pertusus" of the Bordeaux Pilgrim, and the corner stone of the Jewish altar ("Temples of Jews," pp. 191, 225). When having obtained from the Caliph a written promise that he would erect *only one house* of prayer in Jerusalem, ("Topography of Ancient Jerusalem," p. 133), Eutychius goes on to say:— "For when the Romans embraced Christianity, and Helena the mother of Constantine erected churches in Jerusalem, the place of the rock (altar) and those adjacent to it were laid waste, and so left; and they threw dust on the rock, so that a large dunghill was heaped upon it, and the Romans did not reverence it, as the Jews had done, nor *did they erect any church upon it*, because the Lord had said in the Holy Gospel, 'Behold your house shall be left desolate;' and again, 'There shall not one stone be left upon another that shall not be cast down:' on this account the Christians had left it lying waste, and had not erected any church upon it" ("Annales," ii. p. 284).

Now, bearing in mind that the situation and dimensions of the Jewish Temple must then have been easily recognised, and it can, in fact, be proved from a long list of authorities ("Temples of the Jews," pp. 182, *et seq.*) that they were perfectly well-known till at least after the Crusades, it seems impossible to assume that a Justinian church was then standing within the precincts of the Temple. It seems equally certain that when Eutychius wrote, the Moslems had not erected two places of worship in Jerusalem: in fact, that the Aksah was theirs and their only place of worship, which is confirmed by all we learn from all their other historians, while there is no mention of the Dome of the Rock as belonging to them at any age.

Besides this, placing Justinian's Church inside the Temple area contradicts every word that is said by Procopius about the enormous difficulty the Emperor had, and the expense he went to, in getting a level foundation for his church. Where the Aksah stands, or indeed on any spot within the limits of the Temple area, all was flat and solid, and he need not have spent a penny on his foundations anywhere. What he really did we learn from Procopius. He brought up the level of the old deserted site of Solomon's palace to that of the Temple floor, and then erected his church, "Secus Porticum Solomonis," as Antoninus tells us, and there, the remains of its foundations may still be seen in the vaults now known as Solomon's stables.

The only remaining question is, why did Justinian seek this remote, cramped and difficult site for his great monastic establishment, when he had the command of many others in other parts of Jerusalem far more convenient and much less expensive? I answer, unhesitatingly, because he wished his establishment to be near the Anastasis, the Martyrium and other sacred sites of the

Christians, and where it did afterwards form one of the four great churches of Jerusalem (Temples of the Jews, pp. 238 *et seq.*) If any one has any other answer to give, all I can say is that it has not reached my ears.

A very few words will suffice regarding the Golden Gateway, which is the only other building noticed in this part of Lieut. Conder's Paper. He and all the rest of the world are now prepared to admit that it is a Christian building, erected between the ages of Constantine and Justinian. Lieut. Conder says (p. 34) fifth or sixth century. I still maintain, for reasons given in my "Topography of Jerusalem" (pp. 94 *et seq.*), and my "Temples of the Jews" (pp. 229 *et seq.*), that it was the festal portal erected by Constantine, and described by Eusebius as leading to his Basilica. But even waiving this argument for the nonce, and assuming that I am wrong in this, I have asked over and over again who built the Golden Gateway, and why was it placed where we find it? We know the history of Jerusalem perfectly from the time of Constantine to that of Justinian, and not one author, either contemporary or afterwards, mentions the erection of such a building either directly or indirectly, and no one in modern times has ventured even to try to explain why it was erected where we find it. Yet it is an important building, and evidently from its form and construction only a part of a group of buildings which must have been of greater importance than itself; and I hold it to be literally impossible that such a gateway with its adjuncts, could have been smuggled into existence, without anyone at the time or since being able to say by whom or for what purpose it was erected. The nearest approach to an answer is by the Count de Vogüé, who, quoting John of Wurtzburg, a writer during the Crusades, suggests that it was the Porta Speciosa, the Beautiful Gate of the Temple, and re-erected by Christians—he does not hint when or by whom—in honour of the miracle performed there by Peter and John in curing the lame man. The answer to this is: Firstly, that the Porta Speciosa was an inner gate of the Temple, and this is not only outside the Temple and city, as his own plan show, but did not belong to the Temple at all; secondly, that at no time did the Christians ever attempt to rebuild any part of the accursed Temple of the Jews; and thirdly, the Porta Speciosa to which John of Wurtzburg alludes was on the west side of the Haram area. The Golden Gateway is on the east. This answer of the Count's will not therefore suffice, and till some one can suggest a better, my suggestion must be allowed to stand as the only feasible one. Simply ignoring the facts, as writers have hitherto been content to do, is no answer to any honest inquirer who is searching after truth, and that only.

I have now run through, as briefly as I can, all the most important points in Lieut. Conder's Paper, but though I have tried to do it in as few words as possible, I must apologize for having taken up so much time. The subject however is, to me at least, so important and interesting, that I could hardly omit any thing I have said. What I have written on the subject extends to several volumes, and to make what I have to say complete it ought to be nearly as long. I have, however, probably said enough to prove that there is a good deal to be said on my side of the question.

Lieut. Conder, R.E.—In making some further remarks on Mr. Fergusson's reply to my Paper, I wish to be as concise as possible, and to dwell principally on ascertained facts, to which in a Discussion of this kind, it seems to me, the attention should be principally directed, the evidence of various writers being placed second and conjectures last. I hope that the shortness of my answers will not appear discourteous being unavoidable.

The object of my Paper was to describe certain explorations rather than to attack any particular theory. The block plan which I have given of Herod's Temple is the result of many years of study. It agrees with the Talmudic description and with that of Josephus, and I am prepared to defend all its details. Only such details are shown as are described in the Talmud, and I have avoided adding

any fanciful restorations for which no written authority exists. There is no description of Herod's Temple in the Bible. The area occupied by Herod's Temple is stated by Josephus to have been twice as large as that occupied by Solomon's Temple (Bell Jud. I. 21. 1). Thus though I had long studied the question of the earlier Temples, it seemed to me that the question would only be confused by introducing any disquisition as to the extent or position of buildings replaced at a late period, and of which no traces remain.

Objection No. 1.—It is true that the vaults in the south-east corner of the Haram could not support the huge columns—6 ft. in diameter—which adorned the Temple Cloister. But the south-east corner of the Haram was partly overthrown by earthquake in the 11th century, and these vaults are probably Crusading work of the 12th century, masons' marks of the 12th century having been found on some of the stones. Mr. Fergusson omitted to state that the haunch-stones of a ponderous ancient vault have been found inside the existing vaults. Mr. Fergusson's theory that Solomon's palace occupied this corner of the Haram, appears to be founded on the assertion that the "Horse-gate" belonged to it, and is to be recognised in the Triple Gate. I am not aware of any authority for either statement.

If the Master Course be Justinian's work, then all the drafted masonry in the Haram walls is his, for the dressing of the Master Course is the same. On Mount Gerizim we find the walls of a fortress erected by Justinian in 533 A.D. They are of drafted masonry quite different from the Temple stones. The bosses of the stones project 3 inches and are irregular, the dressing is rough and not executed with a toothed chisel, the stones are of comparatively small size. The Master Course remains in my opinion an unanswerable objection to Mr. Fergusson's theory as to the south wall of the Haram, and cannot be attributed to Justinian.

Objection No. 2.—I do not see that Mr. Fergusson has met this. Josephus says of the city wall that "it reaches as far as a certain place which they called Ophlas (or Ophel, universally allowed to have been south of the Temple) where it was joined to the eastern cloister of the Temple" (Bell Jud, v. 4. 2). Captain Warren discovered this wall joining the east wall of the Haram, which is thus identified with the east wall of Herod's Temple.

Objection No. 3.—My remarks on the rock levels are founded on 75 distinct observations, not on "imaginary contours." At the place where Mr. Fergusson's plan shows Antonia the level *outside* the Haram wall has been ascertained by excavation to be 104 ft. below the *Sakhrah*. Mr. Fergusson supposes a precipice to exist *inside* at this point, but even if the rock were on the surface—which it is not—it would be still 20 ft. lower than the *Sakhrah*. Such a precipice is practically an impossibility. If it had existed surely the wall would have been built on the top of it, but on the contrary the western galleries and cisterns in the Haram show no trace of any rock.

Objection No. 4.—Even were the rock found to run level, west of the "great sea," foundations of 60 ft. would be required for Mr. Fergusson's Temple to give the requisite difference of level between the outer court and the floor of the Holy House.

Objection No. 5.—It is not correct to say that the wall turns at a right angle at the Triple Gate. The Haram wall with its Master Course runs unbroken for 922 ft. At the Triple Gate *two* parallel walls supporting the roof of the passage run at right angles to the Haram wall. They are not of drafted masonry and the stones are comparatively small, the masonry appears to be Byzantine work. The north wall described by Mr. Fergusson is not joined to either of the Haram walls, it is merely the south retaining wall of the Platform and of quite modern masonry. I have examined the back of it in chambers under the Platform and can only repeat that not a trace of ancient masonry exists there.

Objection No. 6.—The authority of the Talmud cannot be lightly set aside. The tract "Middoth" refers to the recollections of Rabbis, who saw the Temple standing, and the very latest date that can be assigned to it is the 2nd century, A.D. I have not found the Talmud and Josephus contradictory in any important statement, and the Middoth—describing Herod's Temple—cannot be checked by the Bible, describing Solomon's. The Middoth does not quote Ezekiel. It says the "Mountain of the House" was 500 cubits square; Josephus says one stadium square, a round statement which comes to about the same measure with a 16 inch cubit. Josephus nowhere states the Temple area to have been 400 cubits square. One grave objection to Mr. Fergusson's plan is the shape he gives to the Court of the Women. Josephus and the Middoth agree that it was square; Mr. Fergusson makes it extremely narrow. I do not know on what authority, certainly not that of the Bible.

Turning to the second part of the Paper—Pillars of the Dome of the Rock—I leave architects to judge from the sketches their date. I would only remark that Mr. Fergusson now assigns them to the 2nd century (Hadrian) and that they have no further value in a question of style. What then are the peculiar details of architecture by which Mr. Fergusson is led to ascribe the Dome of the Rock to Constantine?

Dome of the Chain.—Mr. Fergusson denies that Abd-el-Melek built this but cannot say who did. If Mr. Fergusson accepts the Crusading tradition on the subject, why reject the traditions mentioned by the same authors that the *Sakhrah* was David's altar and the stone of Bethel, that the cave in the *Sakhrah* was the place where the woman charged with adultery was brought before Christ, and that the Dome of the Rock was the Jewish temple erected by Solomon?

Latin Inscriptions.—It is quite clear from Theodoricus that none of these occupied the top of the screen where the great Cufic inscription is now found.* The suggestion that the existing inscriptions are all forgeries of the 13th century is open to many objections. Firstly, the mosaic differs from that used by the Crusaders, the cubes being larger and the gilded cubes set at an angle so as to reflect the rays downwards on the spectators; secondly, the forgers must have used Cufic in some cases and Arabic in other inscriptions; thirdly, an inscription in the dome states that the original mosaics were restored in 1027 A.D. Can we suppose a forger to have gone the length of inserting this fact also?

Outer wall of the Dome of the Rock.—The onus of proving this to be Byzantine work still remains with Mr. Fergusson. Round arches were, I believe, used by the Arabs as late as the 9th century, and the round arches in the outer wall have not the peculiarity of Byzantine round arches—the narrow keystone and graduated voussoirs. The mosaics on the outside of this wall are certainly later than the arcades on the top which were filled up to receive them.

Justinian's Basilica.—The remains of a sixth century Basilica have been observed in the Aksah partly supported by Byzantine vaults as described by Procopius. In the place where Mr. Fergusson would look for Justinian's Church no remains or foundations of any kind are found, and he himself states that the vaults beneath would not stand the weight of buildings above them.

Golden Gate.—I have stated my reasons for supposing this building to belong to the 6th century, and to be probably the work of Justinian. I wish, however, to deny that the Golden Gate or any building resembling it is described by Eusebius in speaking of Constantine's Basilica. It is not mentioned by any of the 4th or 5th century writers, nor is it described in any of the travels edited by Titus Tobler before the 12th century. Under the name "Porta Aurea," it is described by most of the Crusading writers.

* El Edrisi, the Arabic Geographer (12th century), speaking of the Dome of the Rock during the time of the Christian occupation, says "it was ornamented with Arabesques in gold and other beautiful works by the care of various Moslem Caliphs."

Omar's Visit to the *Sakhrah* (7th century).—Mr. Fergusson does not seem to see how this story affects his views. The Christians had built nothing on the "Rock."* How then was Constantine's Church standing over it? Mr. Fergusson is obliged to suppose that the site of the *Sakhrah* was transferred to its present position from somewhere else. Thus, according to Mr. Fergusson, the site of the Holy Sepulchre, of Zion south of it, and of the *Sakhrah*, have all three been transferred.

Mr. J. D. Crace.—My excuse for a few words on the subject is that I have for some years been on the Executive Committee of the Palestine Exploration Fund. I should like to say first that I have no theory of my own as to the position of the Temple buildings; and have so far succeeded in keeping my mind open. Nevertheless, when a question of this kind is under discussion, certain questions suggest themselves, and they may perhaps be put to those who have taken such interest in the subject as to publish their several views. I will, with Mr. Fergusson's permission, address one or two questions to him. First, then, do I correctly understand his view to be that the southern wall of the holy enclosure did not, in the time of Herod, extend as far as the south-eastern corner? If that be the case I would ask him how he accounts for the foundation stones of that angle, which are to all appearance some of the most ancient, and were found to bear Phœnician characters? These characters may, I am told, be as late as the time of the Maccabees, but are probably earlier, and in any case could not be later than Herod. If Herod's portico or colonnade did not extend thus far, where did it stop, and what was beyond it? A second question, I would ask, relates to Ezekiel's dimensions of the Temple. Has Mr. Fergusson duly considered the importance of Ezekiel's "cubit" or unit of measurement, which he more than once states to be "a cubit *and a hand breadth?*" If the ordinary cubit were eighteen inches, and the hand breadth four inches, we have twenty-two inches as the unit of measurement. Five hundred of these units give a length of 917 feet, which is closely the actual measurement of the south wall. Like Ezekiel, the Middoth says (Ch. II., 1) "The Mountain of the house was five hundred cubits square:" and that the Middoth cubit was fairly identical with that of Ezekiel may be inferred from the fact that both say that "the altar was twelve cubits square;" Ezekiel *in the very same verse* reiterating that "the cubit is a cubit and a hand breadth." A third point which occurs to me is this: If the king's palace be placed due east of the East Gate of the Sanctuary, as I understand Mr. Fergusson to place it, would it not distinctly prevent the direct rays of the "sunrising" from entering the Temple through the East Gate, as inferred both by Ezekiel and Josephus? The Middoth again (as given by Mr. Fergusson) says (Ch. II. 4) "All the walls were "high except the eastern wall, that the priest who burned the heifer might stand on the top of the "Mount of Olives and look straight into the door of the sanctuary when he sprinkled the blood." The eastern wall was kept low—nothing is said about the palace. One more question on a point which has not, I think, been mentioned to-night: I think Mr. Fergusson holds, as part of his general scheme, that the *Sakhrah*, the Dome of the Rock, is the site of the Holy Sepulchre. It is beyond dispute that this is the summit of what must be Mount Moriah, if the Temple ever occupied any part of the noble sanctuary. Yet here he places the tomb of Joseph of Arimathea, a public burial ground, and the "Golgotha," upon which criminal executions took place. Does he know any scriptural mention of Moriah consistent with these uses? Ezekiel says (Ch. XLIII. 12), "Upon the top of the "mountain the whole limit thereof round about shall be most holy." Would executions have been allowed within stone's throw of the Holy of Holies? In favour of the existing church of the Holy Sepulchre, Mr. Ganneau found in 1874 that it was decidedly built on the site of an ancient Hebrew

* William of Tyre (12th century) also speaks of inscriptions, shewing the *Templum Domini* (Dome of the Rock) to have been built by Omar. This seems to shew that the Cufic inscriptions were not intelligible to the Franks.

burial place; not that I consider that such discovery absolutely settles the question, but it is better evidence than the "Moriah" site can at present command that it was, at least, a place of sepulture. With regard to the effect of earthquake, I would suggest that "made ground" and retaining walls would be more likely to be affected than the solid rock.

C. G. MAYLARD, *Associate.*—I am in the same position as Mr. Crace, being anxious to ask one or two questions on this subject. I have studied the subject for the last two or three years, and have been desirous to produce a plan of the Temple, and to realize what it must have been. Comparing my efforts in that direction with others, I could not make my dimensions accord with the alleged 600 feet of Mr. Fergusson. I found it impossible to place the number of the rooms mentioned in the Talmud in the area given by him. It was the same with the Court of the Women, the dimension of which is given as a square court in the Talmud, and from which I gather that it occupied more space than Mr. Fergusson has ascribed to it.

Again, with regard to the Stoa Basilica, which Mr. Fergusson produces at the length of 600 feet, and adduces as an argument against the length given by Lieut. Conder of 922 feet, that it is incredible as the columns (162 in number) described by Josephus would be 24 feet from centre to centre, giving an impossible intercolumniation.* I cannot conceive any difficulty in the longer length, as it is not feasible that such an entrance as that from the bridge (the remains of which were discovered by Dr. Robinson and Capt. Warren) at the south-west angle of the Haram area would be direct into the Stoa. The walls were undoubtedly fortified, and if so, towers would most probably be placed at each angle of the outer walls, the space under being occupied by rooms for the Temple guard. This is borne out by the description given in Ezekiel, who describes such an entrance, and gives the dimension of 50 cubits from the face of the outer to the inner gate. Mr. Fergusson shows on one of his plans such a tower at the south-east angle. These two towers would occupy a space of about 180 to 200 feet, leaving only 700 feet for the Stoa itself, and giving the columns less than 19 feet from centre to centre, or 13 feet intercolumniation. It is remarkable that such a tower at the south-east angle would take the place of the "Tower that lieth out" mentioned in the Bible, and I believe that is the position such a tower would occupy. Capt. Warren found traces below the vaults under the area of this part of a very thick wall by the side of the Single Gate. Josephus mentions that the thickness of the wall above the Stoa was 8 cubits wide, and therefore it was much thicker below (probably two or three feet more) and this thickness of wall must be taken into account in all calculations.

With regard to the *Sakhrah*, independently of any question of architecture, if I read the description of Ezekiel aright, and to which Mr. Crace has already referred, the Temple was placed on the summit of the rock on which, says the Bible, the Temple was built. A Bible student would find that the Temple was built on Mount Moriah, and that its position was the threshing floor of Araunah the Jebusite, and I believe I am correct in stating that such floors are common in the East, and are most invariably placed on the summit of any rock. The summit would therefore be the *Sakhrah* according to Lieut. Conder, but Mr. Fergusson says we are wrong in that, although seventy-five

* If the intercolumniation of Lieut. Conder is excessive, and assumes the length of the Stoa within the two walls at 892 feet, the columns would be 23 feet from centre to centre, and not 24 feet as given by Mr. Fergusson in his book. On the contrary, taking the measurements of Josephus, who describes the columns being such that three men with their arms extended and touching could span round them the diameter would be the length of nearly the span of one man, or 6 feet, thus taking the length according to Mr. Fergusson at 600 feet, and deducting the two walls 15 feet each, the 38 whole columns 6 feet each, and the two half columns 3 feet each, leaves 336 feet for the intercolumniation of the whole, which gives to each one 8 feet 5 in., or about $1\frac{2}{5}$ diameter, *a small intercolumniation.* Allowing that two towers were placed at the angles the intercolumniation is $2\frac{1}{6}$ diameter.

observations have been made of the rock level of the area. The Bible student has now to choose between the two theories, and which is he to choose?

Capt. BURTON.—I will only remark that I perfectly agree with Mr. Fergusson about what has been called by myself the "migration of holy places." We have a fine specimen of what is going on in that respect in the present day. The place of St. Paul's assumed emersion lies on the Jerusalem-Damascus road. That very out-of-the-way place for travellers from Bayrut who use the French *diligence* road is gradually working nearer to the latter. With regard to the holy sites of Jerusalem, an extensive study has shewn me that there is not one single ancient site upon which I can have the slightest reliance. For instance, all the stations of the Passion are Franciscan, the identification of that unlearned order. The Greeks, who are far more ancient, utterly ignore all these stations.

R. PHENÉ SPIERS, *Fellow.*—My stay at Jerusalem in 1866 was of such short duration comparatively, and my time when there so constantly occupied with drawing, that I had not the leisure to make that careful examination of the masonry and decorative details of the walls and buildings of the Haram, which would justify me in giving any decided opinion upon the questions raised by Lieut. Conder in his interesting Paper. Besides, at that time, the Palestine Exploration Expedition had not been started, and less attention was drawn to the disputed points than is now the case. Lieut. Conder remarks that the dressing of the more ancient drafted masonry occurs only as far as has been ascertained in the Jerusalem and Hebron Harams; the great similarity however of the earlier masonry at Baalbec, more especially that forming the original principal entrance to the citadel, led me to the conclusion that it might possibly have been executed at about the same period. Lieut. Conder does not himself suggest any period at which the most ancient of the three kinds of masonry mentioned was executed. These three kinds are: Firstly, Ancient drafted masonry of three varieties, all of which he ascribes to the same date; secondly, Byzantine work; and thirdly, Crusading or Saracenic. If all the first kind is of one period, that period can only be that of Herod. Capt. Warren, however, in the work on "the Recovery of Jerusalem" (pp. 317-318), gives his opinion that the south-east corner of the enclosure wall running 300 feet north and 600 feet west is the actual wall built by King Solomon, and argues that it formed part of the substructure of his palace which he (Capt. Warren) places at this corner of the Haram area. He further ascribes to the same period the walls running from Wilson's arch to the Prophet's gate, being he states the west wall of his temple's enclosure. M. Viollet-le-Duc in his "Entretiens" (p. 217), arguing from a careful examination of photographs, points out that if the masonry immediately above and contiguous to the haunch of Robinson's arch is Roman, which in his opinion it is, the masonry below must be of an earlier date earlier by some centuries; so that in that case the north-west corner of the Haram walls, including those in the Jew's Wailing Place, must be ascribed to an earlier date than Capt. Warren is disposed to allow. I confess that I had hoped the results of the careful examination of every part of the Haram walls, even down to their foundations, would have thrown more light on the actual period of their construction; this discovery however seems to be as far off as ever.

Lieut. Conder in making his calculations puts the cubit down as 16 inches, because half-a-cubit (8 inches) would seem to be a reasonable height for a step of the Roman period. They were however unusually high according to our modern notions, and I have it on Mr. Alma-Tadema's authority that about eleven inches was the usual height.

Lieut. Conder ascribes the Golden Gate to "*Justinian who is said to have boasted that he had surpassed Solomon.*" This exclamation, I have always understood, referred to the erection of the magnificent dome of St. Sophia, at Constantinople, a task infinitely more difficult of accomplishment than the Golden Gate.

In any critical examination of the decorative details of the Mosque of Omar, the Golden and other gates of the Haram, it becomes necessary to bear in mind that there seem to have been two schools of sculptors or carvers in Palestine, the one indigenous to the country, perhaps being influenced by the architecture of Central Syria, (though the tombs of the kings and the judges are probably of earlier date than anything found in Syria by M. de Vogüé); the other influenced and probably executed by Roman artists, or by artists from Rome. The temples at Baalbec, Palmyra, Pompeiopolis and other places were carved by the latter, to which, also, might be added (judging from Lieut. Conder's illustrations) the Mosque itself, more ancient, he says, than the used-up capitals. M. de Vogüé, however, in his details gives a Byzantine aspect to them, the same character being given to the foliage as in that of the buildings of Central Syria. The Golden Gateway and other Byzantine works in the Haram belong, I think, distinctly to the Palestine or Syrian school, and on those grounds there is no reason why they should not be ascribed to the period of Constantine, or even earlier. The carving of the foliage on the Golden Gateway is either much earlier than that in the Mosque of St. Sophia, or (on the supposition that Byzantium was the architectural centre in Justinian's time) the earlier character of the former might be ascribed to its execution far away from that Capital. I am inclined, however, from a careful comparison of the two buildings to the first opinion.

I have but one other point to draw attention to with reference to the Mosque of Omar. In Mr. Fergusson's works the drawings by Mr. Arundale show a keystone (with slight projection) to the arches of the interior under the dome; M. de Vogüé makes the arches pointed; my own drawing (pencilled in with the camera lucida) shows the arches to be distinctly semi-circular, and this fact is borne out by Lieut. Conder. In the photograph, however, he remarks (and I notice the same peculiarity) that the arches have the appearance of being struck from two centres with the keystone of a semi-circular arch: underneath the veneer of marble with which these arches are covered I understand there is a circular constructive arch, and it would be interesting to know at what period the veneer was added, and whether it formed part of the original design. In conclusion, whilst expressing my thanks to Lieut. Conder for his interesting communication, I ought to say that I have formed no theories on the subject, one way or the other, and any controversial remarks I may have made are put forth in the search for further information.

James Fergusson, F.R.S., *Past Vice-President.*—It is seldom I have listened with a greater feeling of satisfaction than I have to the Reply you have just heard from Lieut. Conder. From the hurried manner in which I spoke on the last occasion, and the short time necessarily allowed for correction or verification, I could not but be afraid I might have laid myself open to a rejoinder, on some points, that would not have been pleasant, and it is a considerable relief to find that none such have occurred. It is satisfactory also to know that there is not one of his objections which it would not be easy to answer at once, but for one circumstance, which is not my fault: it is because, as he never gives references, it is in most instances extremely difficult to know what his statements refer to. In none of the works published by Capt. Warren and Lieut. Conder about Jerusalem are any references given to the passages in the voluminous works from which they profess to be quoting; nor are any passages translated at sufficient length to enable the reader to understand their bearing on the subject. Such works, I have no hesitation in saying, could not be published on the Continent; and even in this country, though they may be patronized by orthodox societies and partisan "Reviews," they are absolutely worthless for purposes of scientific research, and much more calculated to mislead than to instruct.

Not to travel beyond our present materials. In the Paper Lieut. Conder read here on the 2nd instant, there is not one single reference to any ancient author, nor even one to any passage in any work of mine; though the main object of the Paper was to refute my heresies. The result is, that

though I may be able to guess what he is driving at, I venture to say, that there is not a single individual in this room who, in a single instance, knows where the passage is in any of my works which he is professing to refute, or who can consequently refer to it, to see if it is fairly quoted, or to find out what has been said on the opposite side. Such a mode of controversy is so manifestly unfair and unsatisfactory, that it would not for one moment be tolerated in any foreign country on any scientific question, nor would it be allowed here, except when a certain quasi-religious element is considered of sufficient importance to admit of any means being employed to attain what is considered as a desirable end.

Without further preface, I will now try and point out what I consider unsatisfactory, in the more important answers given by Lieut. Conder, in the Reply you have just heard. To answer all would take up too much time, besides many are obviously trivial, and others are unintelligible for want of references, but I trust that what I am about to say will be sufficient to enable you to judge of the general character of his statements. As a rule, his objections appear to me so frivolous and irrelevant, that it is not without a sense of humiliation that I feel called upon to answer them, and would not condescend to do so, were it not that they are of about the average merit of those usually urged against my views; and to decline to answer is, with most people, tantamount to admitting my inability to do so.

Lieut. Conder begins with a not very clearly expressed allegation, that I made Herod's Temple of the same dimensions as Solomon's.

When I last spoke in this room, I said "we know that Solomon's Temple measured 300 cubits east and west by 100 north and south" (p. 39); and I always have adhered to the statement that Herod's Temple was 400 cubits square. Solomon's, therefore, covered 30,000 square cubits; Herod's 160,000; or more than five times the area of the other, which can hardly be called equality.

Objection 1.—It is much to be regretted that no reference is given where an account of it may be found, as these Jerusalem earthquakes are among the most remarkable natural phenomena I am acquainted with. According to Mejr-ed-din, one shook down the whole of the south-eastern angle of the Aksah in A.D. 747, and when it was repaired, threw it down again 30 years afterwards ("Temples of the Jews," p. 252), and now a third tumbles down the still standing arches in the south-east corner of the Haram. The "haunch stones" of which Lieut. Conder speaks, occur, so far as I know, only in the angle, within the limits of the Tower that "lieth out," and have nothing whatever to do with the Vaults. These earthquakes it seems were confined wholly to the immediate proximity of the "master course," and certainly did not extend either to the Dome of the Rock or to the Golden Gateway, where not a tessera has fallen off, or the slightest crack anywhere appears. If Lieut. Conder knows who built this "master course," and why it was put where we find it, why does he not say so? I cannot, nor can I see what its bearing is on the subject. It appears to me the most natural thing in the world, that a taller course of stones should mark, on the outside, the level inside of the inner Court of Solomon's Palace; and the summit level of the rock at the Triple Gateway. But till it is explained who put it there, and why, it is idle to discuss it.* The theory that these vaults were built

* This "master course" may, I am constrained to think, overwhelm us. In Warren's "Recovery of Jerusalem" it is said to extend only as far as the Huldah Gates, about 550 feet from the eastern angle, (pl. p. 119); on the 2nd of December it extended only "beyond the limits Mr. Fergusson proposed" (p. 30). It now extends across the whole 922 feet of the southern wall, though no one, so far as I know, ever pretended to see it to the westward of the Double Gates. All this, however, seems to me of the least possible consequence. If it was built by Solomon it was part of his palace. If in Herod's time, it was either part of the Temple or of the walls erected by Herod Agrippa (B. J. v. 4, 2); or if by Justinian, it was part of the foundations of his great establishment, described by Procopius. Till it is ascertained who actually built it, I cannot conceive any serious argument being based upon it, and when that is ascertained, I see no difficulty in accounting for its presence at any time between Solomon and Justinian.

by the Crusaders has at least the merit of novelty—when and wherefore is not explained. If it depends only on masons' marks, all I can say is, I know of no instance at any time or in any place where a building's age has been ascertained from such materials. My reasons for stating that Solomon's Palace occupied the south-eastern angle of the Haram are given in the sixth Chapter of my "Temples of the Jews" (pp. 40 to 52, plan No. 1.) The Horse Gate was placed where the Triple Gateway now stands, because it was an adjunct of the Palace, and the situation seemed to fit all we know of it, and was near the Hippodrome of Josephus (B. J. II, 3, 1). I never said that the Palace was placed in the south-east angle, because the Horse Gate was where I put it; my contention was that the situation of the Horse Gate followed from the position of the Palace.

Objection 2.—Josephus's assertions are not *always* to be relied upon, and when contradicted by facts must be abandoned. Unless it can be proved that the Stoa Basilica extended to this angle—a theory that now seems abandoned—and that Solomon's Palace did not exist there, it is impossible that the wall of Ophlas should have joined the Eastern Cloister of the Temple. I simply prefer the testimony of Nehemiah, iii. 27, above referred to, which directly contradicts Josephus, but is perfectly consistent with the discoveries of Warren and with all the facts as now known.

Objection 3.—It would have added to the clearness of this statement if Lieut. Conder had stated if the 75 observations were all in the Haram area, or dispersed over Jerusalem, and where they are published, if at all. Meanwhile it may be some index to their value, to know that when he wrote to the *Builder* on the 10th of August last (p. 839), the Temple required foundations of from 40 to 50 feet in masonry, above the surface of the rock, while on the 2nd of December the figures were extended to from 60 to 90 feet. A very remarkable change of level in six months, and not easily to be accounted for, as no earthquake, that I know of, had occurred in the interval.

It does not seem to be of the least use our arguing about the form of the rock between the *Sakhrah*, and the place where it is again seen 400 feet off, under Wilson's arch. Neither Lieut. Conder nor any one else has ever seen it between these two points, and any theory consequently that may be formed regarding it must be pure speculation. It is admitted there is a fall of 104 feet, and consequently no impossibility of a cliff 50 cubits high, if Josephus's figures are to be depended upon, which they seldom are in so far as heights are concerned ("Temples of the Jews," pp. 8, 16 and 130); and after all very little depends upon it. If the temple was 600 feet square, the position of Antonia is certain, and cannot be moved many feet from where I placed it.

Objection 4.—This is startling. What I said ("Temples of the Jews," p. 93, W.C. 13, pl. 11, &c.) was that the inner court of the Temple was raised 18 steps or 9 cubits above the court of the Gentiles. The holy house had a basement 6 cubits high, and there may have been 3 steps (1½ cubits) between the court of the Altar and that of the Men of Israel, altogether 24 feet 9 inches, and by that I stand. Where Lieut. Conder found 60 feet I am at a loss to conceive. It is not to be found in any work of mine.

Objection 5.—This contains six statements, each of which would require a long paragraph to answer, but the principal one is the daring assertion that the wall does not turn at a right angle at the Triple Gateway. I can only appeal to the Ordnance Survey and the folding plate opposite page 230 of Warren's "Recovery of Jerusalem," which directly contradict this assertion. That the southern end has been manipulated in Byzantine times, I am quite free to admit. In fact I look upon it as indisputable that the vault of the Triple Gateway, and all that Capt. Warren called the "weak vaults of Byzantine age," to the eastward of it, were erected by Justinian. Unfortunately the wall is not uncovered as far north as Solomon's temple, and the masonry we now see may be the work of the "many kings," who, Josephus tells us, extended Solomon's porch to 400 cubits in length (Ant. xv. 11, 3, xx. 10, 7). I never stated that what we now see above ground was the actual north wall of

Herod's temple, but I repeat my conviction that we should find that it stands in its exact position and on its foundations if we could dig deep enough to find them.

Objection 6.—No one is less inclined than I am to underrate the value of the Talmud as an authority when properly read. So much is this the case, that I printed a translation of the Middoth *in extenso*, as the first appendix to my "Temples of the Jews," and have examined with care every one of the statements, and I challenge the production of one I have overlooked; but I do not know the name of any of its writers who ever saw the temple while it was standing, and would feel obliged to Lieut. Conder if he would furnish me with one.

Putting minor difficulties aside, the great difference between us is in respect to the court of the Women, which, as I tried to explain when I last spoke, was 35 cubits, *plus* the 100 cubits the Rabbis had to spare, from their calling the temple 500 cubits square from a mistaken interpretation of Ezekiel, instead of being content with the 400 cubits of Josephus.

I for one, would be quite content to rest this part of the case on the plan of the Temple, given by Lieut. Conder with his Paper; the only difficulty being that it is without the names of the various parts being written upon it, as his Paper is without references. It is easily followed, however, by those familiar with the Talmud.* He makes the court of the Women 135 cubits square, or nearly as large as the great court, containing the temple and altar, with the courts of the Priests and of the Men of Israel. The latter is the narrow slip just within the Beautiful Gate, and he makes it 11 cubits by 135. In other words he assigns 1,485 square cubits to the *Men* of Israel and 18,225 to the *Women*. Credat Judæus! I don't know anywhere a more complete *reductio ad absurdum*. The assertion that Josephus says the court of the Women was square is new to me, and though it is hazardous to contradict where no reference is given, I do not believe he does say so. If Lieut. Conder is prepared to deny that one Greek stadium and 600 Greek feet are not synonymous terms, he may be right, but at all events he must admit that Josephus states that "the whole enclosure was 4 stadii in circuit each side or angle measuring one stadium in extent" (Ant. xv. 11, 3.) In the same chapter, section 5, he describes "the Stoa Basilica as one stadium in length," and it was one side of the square; and further on he describes Solomon's porch, which formed another side, as 400 cubits long (Ant. xx. 9, 7). If that is not equivalent to saying that the Temple was 600 feet square I do not know what it means.

If Lieut. Conder wants to know my reasons for the form I give to the court of the Women, he will find them in the eighth chapter of the second part of my "Temples of the Jews," (pp. 117, *et seq.*); they are too long to repeat here.

Pillars of the Dome of the Rock.—I never did assign them to Hadrian. What I said (*ante* p. 43) was that in the two centuries and a half, during which the Romans held Jerusalem, they built many buildings from some of which the pillars or capitals may have been borrowed. I instanced Hadrian's Temple of Jupiter, and the Temple of Venus described by Eusebius, as two of them, and I repeat my assertion that all the capitals in the Dome of the Rock are either of Constantine's time or anterior to it, which is all my argument requires; while many of those in the Aksah are of forms subsequent to the time of Justinian.

Dome of the Chain.—I do not see the *sequitur*. Because from the Latin inscription I quoted, and the extreme probability of its being so, I stated my belief that this building was originally erected by the Christians at some early, but now unknown epoch, as the tomb of St. James: it by no means follows that I am to believe all the absurd traditions invented by the Crusaders to extricate themselves from the absurd position they had got themselves into from having two sepulchres of

* "The Talmud," by Joseph Barclay, LL.D., Murray, 1878. The plan of the Temple given by him is nearly identical with Lieut. Conder's, but Dr. Barclay does not pretend it is correct; merely that it is what the Rabbis believed it to be.

Christ. He might as well ask me to believe in all the absurdities gathered beneath the roof of that one in the town itself, which he believes, though I reject it and them *in toto*.

Latin Inscription.—I must again refer him to what I said before (page 44), and to the third chapter of the third part of my "Temples of the Jews," for what I have to say on the subject. The argument is too long to enter upon here. There is nothing in this paragraph that any way affects the arguments there used, but if he had read page 220 he would not have added the note he appends. What William of Tyre saw and read were inscriptions put up by the Moslems, when they redecorated the Dome of the Rock in 1027 A.D. They were not of course the same that we now see, because they were cleared away by the Crusaders to make room for the Latin inscription above referred to.

Outer Wall of the Dome of the Rock.—I have accepted the onus of proving the outer wall to be Byzantine ("Temples of the Jews," Part III., Chap. II., p. 199 to 217), and I adhere to all I then said. The external mosaics have not yet been published, nor do I know of any opinion being expressed as to their age. If Lieut. Conder knows their age, it would be well he should say so. They are of course more modern than the wall they adorned. The question is how much?

Justinian's Basilica.—This is no answer to my allegation, that Justinian's building was not situated within the precincts of the accursed Temple of the Jews. I deny that any remains of a sixth century basilica are found in the Aksah, except some capitals borrowed from some destroyed Christian buildings in some modern repairs. I equally deny that I ever said that the vaults in the south-east angle could not support the weight of the buildings I placed upon them. On the contrary I showed on my plan (W. C. 73 and plate vii.), how I believed the buildings were distributed: the church on the solid parts, the cloisters and *cœnacula* over the vaults, which are quite sufficiently strong to bear such residences, though not to support the columns of the Stoa Basilica.

Golden Gateway.—I am not at all surprised at Lieut. Conder's denial, that Eusebius mentions the Golden Gateway, as he does not seem to have read the principal authorities on the subject; but if he will turn to the Vita Constantini (III., 39), he will find that after describing the Basilica erected by Constantine, with its atrium and its porticos and gates (Πύλαι), he adds "Beyond these the vestibule (Προπύλαια) of the whole group of buildings, situated in the middle of a broad agora and ornamented in the most ambitious manner, and so placed that those who were outside when they looked inward were struck with the magnificence of what they saw" ("Temples of the Jews," p. 238). I do not know any form of words that could describe more accurately the Golden Gateway and its position, as shown in my plate v. and as described in the text of my work; but even if Lieut. Conder chooses to ignore this, he, like every one else, carefully avoids even trying to answer my often repeated question—If Constantine did not build the Golden Gateway, by whom was it erected?

Omar's Visit to the *Sakhrah*.—I fancy I do see perfectly the bearing of the account of Omar's visit to the *Sakhrah* on my theory, but I despair of making it clear to others, in a single paragraph, and I must therefore ask those who want an answer to this objection to read what I have said on the subject in my "Topography of Jerusalem," where the references are all given and quotations to such an extent as are requisite for understanding the subject (pp. 130 to 145). He will there see that Omar did not creep in by the Prophet's Gateway, as Lieut. Conder states (p. 34), on his hands and knees, as the historians say, to find the present *Sakhrah*, which if not covered by the Dome of the Rock must have been visible above ground and accessible to all. It is equally certain that he built the Mosque that bears his name "behind the *Sakhrah*" (135), and that Abd-el-Malek so enlarged it that he brought the *Sakhrah* within the limits of the Aksah.* In fact not one word of these mediæval

* Auxit Templum ita ut petram inferet in Templi adytum—Eutychii Annales ii., p. 364. El Macin, p. 69.

histories is intelligible on the supposition that the present *Sakhrah* is the one Omar sought and found, but all becomes perfectly clear when we assume the *Sakhrah* to have been the "Lapis Pertusus" of the Bordeaux Pilgrim, and the corner stone of the altar of the Jewish temple ("Temples of the Jews," pp. 189, *et seq.*)

I have now run through every paragraph of this second Paper of Lieut. Conder, as briefly as I can, but I trust with sufficient fulness to justify what I said when I last spoke, and characterised as nibbling at the details of the argument while ignoring its more important issues. The fact is, the main argument between us lies in a nutshell. There are two great points, and practically only two that require to be settled before the argument can be placed on a firm basis. The first is, what was the site and dimension of the Temple of the Jews? The second is, were these known or were they not, during the time that elapsed between Constantine and the Crusades?

With regard to the first, I have prepared an elaborate plan, Pl. II. of my "Temples of the Jews," with all the requisite drawings and references and authorities set forth, (pp. 71 to 182, of that work), and by all this I am prepared to stand or fall. With regard to the second, I have, in Chapter XII, Part II, collected a certain number of authorities sufficient to prove the second proposition, and with the incidental notices in my "Temples of the Jews," and other works on Jerusalem, I believe ample to settle that branch of the subject. If then the Temple was of the dimensions, and in the situation in which I place it, and this was perfectly well known down to the time of the Crusades, it appears to me idle to contend that Abd-el-Malek or any one else during the dark ages, built the Dome of the Rock as a new temple on a site outside what was known to be the Temple area, and over a rock which neither the Bible, nor the Talmud or Josephus, nor anyone else, except the late Moslems, mention as a part of, or appertaining to the Temple.

Lieut. Conder does not approach the evidence on which the second of these propositions is based, it therefore stands as I formulated it, and must be allowed to stand till some one shows its falsity. With regard to the first, he uses a perfectly legitimate mode of argument in proposing an alternative plan covering an area considerably larger than mine. This he boasts "agrees with the Talmudic description and with Josephus, and he is prepared to defend all its details." Nothing can be better! If he will only draw out his plan with the same amount of detail that I have put into mine, and accompany it with the same amount of references and illustrations that are found in my "Temples of the Jews," the public will be able to judge, and will very soon decide which is to be preferred. If his is better than mine, there will be nothing for me but to withdraw from the contest, and hide my diminished head, though the prospect of this does not, I confess, at present terrify me.

Meanwhile, I would like to be allowed to remark, that his theory of the Temple seems to me to be based on a very slender foundation. As explained (page 31), it rests principally on the fact that Josephus says it stood on the "*top of the hill.*" Of course no reference is given, and consequently probably not one man in this room knows where the quotation is taken from or how it is borne out by the context, and I know what I am exposing myself to when I venture to assert that I do not believe any such passage is to be found in the works of Josephus. What I believe Lieut. Conder was thinking of when he made this statement is the first paragraph in the fifth chapter of the fifth book of the Wars of the Jews. It is there said "The Temple, as has just been said, was built on the ridge (λοφος) of a strongly accentuated hill. When they began to build it, the plain on its top barely sufficed for the temple and altar, for it was on every side abrupt and steep." In the first place I would remark there is no definite article in the Greek passage which would imply it was *the* hill *par excellence;* and in the second, that the concluding part of the paragraph is fatal to the theory. Fortunately Lieut. Conder furnishes us with a section through the hill (pl. III.), and his description of

the rock levels (page 31), which I presume his theory depends upon, prove that the hill was neither steep nor abrupt, but that there was abundance of room, and to spare, for both the temple and the altar, so that in so far as Josephus' testimony is concerned, the Holy of Holies was not where Lieut. Conder places it.

If this keystone of his arch fails, I am afraid this theory must be abandoned, for, so far as I know, he and Dr. Chaplin were the first seriously to propose such a solution of the difficulty. I need not say that I know of no passage in either the Bible, or Josephus, or the Talmud, which could be adduced to support it. But what is more to the purpose, no one else has hitherto found anything anywhere to support any such hypothesis. It is quite original, and therefore must require something very distinct to make it acceptable. I need hardly add that there is nothing in the few lines (pp. 31 and 32) which Lieut. Conder devotes to this subject, that at all helps in this matter. After his account of the rock levels, there is nothing but a few hazy allusions to the Bible, Josephus and the Talmud, without a single reference; and which consequently are absolutely worthless for any scientific purpose, or any real argument either for or against the proposition.

The truth of the matter is, unless I am very much mistaken, that when any one with any competent knowledge of the subject, looks into the matter, it will be found that Lieut. Conder's theory of the Temple is as worthless as that proposed by his friend Capt. Warren. That was based mainly on two assumptions: Firstly, that Josephus used a cubit of 21 inches, which he never did; and secondly, that when he said feet, he meant cubits, which he never said. No attempt was made to prove either of these assertions, but as the general public willingly accept whatever is asserted with sufficient confidence if it agrees with their preconceived views, I do not know if any one ever questioned what was so manifestly untenable. If they could be sustained, it was of course easy to prove that the Temple was practically 1000 feet square, and occupied the whole southern portion of the Haram area, and so all difficulties were solved.* There is a delicious simplicity about this military method of cutting the Gordian knot, that may well excite the envy of civil enquirers. Anyone of ordinary intellect may in ten minutes guess such a solution as this. It took me nearly two years to elaborate and publish mine, and I am so dull as to believe it could not be done satisfactorily in less time.

As both these theories have been published by the Palestine Exploration Fund, and consequently are by the public believed to have been adopted by them, or at least received their sanction, while as Lieut. Conder's has received the unqualified approbation of so high and discriminating an authority as the *Edinburgh Review* in its last number, it is to be hoped that their gallant authors will elaborate them in such detail and with such illustrations as to render them intelligible to the general public. If, in doing this, they can either singly or together produce a plan that will supersede mine, they will earn the lasting gratitude of every orthodox Englishman, for having by that means refuted the pestilential heresies regarding the site and details of the Temple, of which I am generally assumed to be the misguided author.

There can be no difficulty in answering Mr. Crace's four questions, only it is trying to one's temper to have to repeat over and over again the same answers to questions that never would have been asked by any one who had read my works. Not that I blame Mr. Crace for this. Indeed, I can honestly say, I have not yet met with anyone who has read my last work with sufficient care to understand its arguments, and certainly nothing has appeared in print that shows that the writers

* Capt. Warren's theory was first published in the *Athenæum* in February, 1875, afterwards in the Quarterly Report of the Palestine Exploration Fund, 1875, pp. 97 *et* seq.

have done more than spend an hour or two in turning over its pages. But in answer to his first question I would merely refer him to the sixth chapter of my work on "The Temples," especially p. 41 and plan No. 1, where he will find that I adopt, *in toto*, Capt. Warren's discoveries and the inferences he draws from them: that the substructures of the south-east angle are of the time of Solomon. I believe them to be the substructures of the "Tower that lieth out by the wall of Ophel" (*ante* p. 40), and part of the king's high house, and consequently proving that it is literally impossible that this angle tower could form part of the Temple, either as built by Solomon or rebuilt by Herod.

The second question, with regard to the length of the cubit, he will find answered, (Chap. III, pp. 15, et seq.) The fact being that from the building of the Tabernacle to the writing of the Talmud wherever the same object is mentioned, the same number of cubits is assigned to it (Table p. 16), and as we know that Josephus used the Greek cubit of 18 inches—400 to one stadium, or 600 feet (*ante*, p. 55), we know that the Bible and the Talmud used the same, and when protracted in the Ordnance Survey they come right within 1 to $1\frac{1}{2}$ per cent. of that measure. We may therefore say that we know, for certain, that the measure used by all the authorities was a cubit of 18 inches.

With regard to the levels. The floor of the inner court of the Palace, now called "Solomon's Stables," is 40 feet below the level of the Haram. The floor of the Temple was 24 feet 6 inches, say 25 feet, above the Haram area, making together 65 feet. The height of the House of the Cedars of Lebanon—the only one that could have interrupted the view—I make 45 feet (30 cubits*). The ridge of its roof was consequently 20 below the level of the floor of the Temple. From this, however, must be deducted the difference between the level of the two courts of the Palace. I make that 8 to 10 feet, which still leaves the eye of a man standing on the front steps of the Temple 15 to 16 feet above the ridge of the highest building of the Palace. He could see at least half way down the Mount of Olives.

With regard to his fourth query, I must again refer Mr. Crace to the seventh Chapter of my work on the Temples, where he will find a far better answer to his question that I can give now. For his quotation from Ezekiel, I would like to substitute another (p. 55). After rebuilding the Temple, the Prophet exhorts them, "that they should no more defile the place where God dwelt in the midst of His people, and His holy name by the carcases of their kings in their high places," &c. (XLIII. 7 to 9). I would like to refer him also, as respects the Kidron, to II Kings, 6 and 16.

The "Mountain" spoken of in XLIII, 12, was 4500 feet square, and included not only the Temple but the whole city and any buildings or tombs that were included in its precincts.

There are only two points in Mr. Maylard's observations, that do not seem to me to have been answered in the previous discussion. It is easy, of course, to shorten the intercolumniation of the Stoa Basilica by introducing towers, but for this there is absolutely no authority, and the internal foundation of the eastern tower would certainly now be found if it ever existed. Even then, however, it does not get over the difficulty: that beyond 600 feet from the south-west angle there is nothing for the pillars to stand upon. A threshing floor in the east, as I understand it, is a flat circular space 100 to 200 feet in diameter, on which the sheaves are spread, and the grain trodden out by oxen or horses. A rugged pointed rock like the *Sakhrah* being used as a threshing floor seems to me an impossibility. If any one ever saw or described such a thing, it would be important that a reference should be given to it. I certainly never saw or heard of such a thing.

Mr. Phené Spiers's observations are addressed more to Lieut. Conder than to me, and do not seem to call for any observations on my part, except perhaps the last. Mr. Arundale's drawing of

* "History of Architecture," Vol. 1, W.C.'s 104, page 211.

the Dome of the Rock ("Temples of the Jews," pl. VI.) is in so small a scale that it is not easy to feel quite sure what the form of the arches is. When first published in my "Topography of Jerusalem," I certainly understood that they were not perfectly semi-circulars, but as the arch of the "Ecce Homo," which is undoubtedly earlier than Constantine's time, was struck from two centres, if not from four, I felt no argument could be based on this, and have since taken no pains to ascertain what their absolute form is. It is to be regretted that Lieut. Conder did not ascertain this when he had the opportunity (see correspondence in the *Builder* from June to August last); but after all, as it has been suggested, what we now see may be only veneer, and consequently of no great importance.

I have now run through all the various objections made this evening to my views, as succinctly but as distinctly as the time allowed me would admit of, and, I trust, have said enough to show that something at least could be urged in favour of my theories. The true and only complete answers are to be found in my works, especially my last, but if people will not read what is there said, I cannot fancy they will, or ought to be convinced or satisfied with such crumbs of the argument as are contained in this discussion. It has been an ungracious task, and so far as my experience goes, an entirely unprofitable one. Over and over again I have answered objections of the same sort, and so completely, that, except in the one instance of the writer of an article in the last number of the *Edinburgh Review*, more remarkable for its personalities than for its arguments, no one ever returned to the charge, though no one ever confessed he had been mistaken in any of his assertions, —and even then it took the Reviewer eighteen years' reflection before he ventured again to approach the subject.

I have read carefully and thought deliberately over every thing I have seen urged against my views, and, if I knew myself, would be as ready to recant in all instances as I have in the one where my original views were shewn to be untenable. When I first wrote on the subject, I was led to believe that Constantine and his Assessors must have known where the true Sepulchre really was. Since it was shewn that this was not so, I have in every thing that I have written since 1861, been content with the formula that the Dome of the Rock was erected by Constantine over *what he believed to be the Sepulchre of Christ*. With regard to the other point, there is nothing in the incoherent and irrelevant declamations of the *Edinburgh* Reviewer, nor in what has been brought forward by Lieut. Conder, that at all induces me to believe I am mistaken in any of the statements I have advanced in my last publication. Where the actual "Tomb of Joseph of Arimathea" really was, I do not pretend now to be able to say, beyond this, that it was certainly within the limits of the great Jewish Cemetery which then existed north of the Temple, but outside the City walls (Josephus B. J. V. 4, 2), at the time of the Crucifixion, and if not actually under the Dome of the Rock, at least in its immediate proximity.

I still maintain, and must be allowed to do so, till some one points out my error in a scientific manner, that the Temple was where I put it, and with the dimensions I assign to it; that Constantine built the Dome of the Rock and the Golden Gateway; and that all the scenes of the Passion took place on the eastern and not on the western hill, with all the various and important consequences that flow from these assertions, as set forth in my most recent work on the "Temples of the Jews and other Buildings, in the Haram Area at Jerusalem."

III.—REMAINS OF BUILDINGS IN MIDIAN. By Captain Richard F. Burton.

Mr. President and Gentlemen,—If I appear before you in the light of that "very clever, learned and civil gentleman," who lectured the "Father of Medicine" upon the art of healing, your Secretary alone is to blame. He suggested that even a non-architect might lay before the Royal Institute of British Architects novel, and perhaps interesting, details concerning the "Remains of Building" in a land so little known as Midian. I am here to answer the invitation, and I venture to hope that you will be good enough to correct and to rate these details at their proper value.

But before entering upon the subject proposed to me, we must determine where Midian is and what it is. You need hardly be told that before the Year of Grace, 1877, "Midian" was a word and little more. Some mappers extended its vague and mysterious limits deep into the Peninsula miscalled Sinai. Others stretched them northward to, and even beyond, the parallel of the Dead Sea; while the "Coryphæus of the Encyclopædists" reduced Midian to a "Canton of Idumæa"; and so forth.

On the other hand the Bedawin, who now hold the soil, speak with no uncertain sound. Arab tradition, it may be observed, allows many things to slip from memory; for instance, it has clean forgotten "Ophir" of golden fame. But when it does retain a name, or the semblance of a name, as *El-Khaúlán* for "Havilah," and *Es-Sabá* for "Sheba," we may rely upon its truth. And Midian is a case in point.

Arz Madyan—the land of Midian—in the language of its actual tenants, begins northwards with the Fort of El-'Akabah (in lat. 29° 28′); and, subtending the seaboard, extends south to the Fort of El-Muwaylah (N. lat. 27° 40′). It has therefore a latitudinal length of 108 direct geographical miles. For political, geographical and other reasons, I have ventured to call it "Madyan Proper," or "North Midian," in opposition to "South Midian." The latter section would stretch from the Fort of El-Muwaylah as far as the Wady Hamz in N. lat. 25° 55′, or 105 miles. Thus the total extent of the Midianite seaboard is 213 direct geographical miles, a line which the extensive sinuosities of the coast may prolong to nearly 300. Midian, both north and south, forms the easternmost province of Egypt. Like H.H.'s "Mameluke" predecessors, the Khediv, Ismail I. of Egypt, a Prince to whose liberality and perspicacious views both my Expeditions owe their existence, still garrisons the seaboard forts. Even considered mineralogically, the land falls into a two-fold division. In northern or Upper Midian, the ancient Egyptians mined for copper, while the Nabathæans and their successors worked Southern or Lower Midian chiefly for gold.

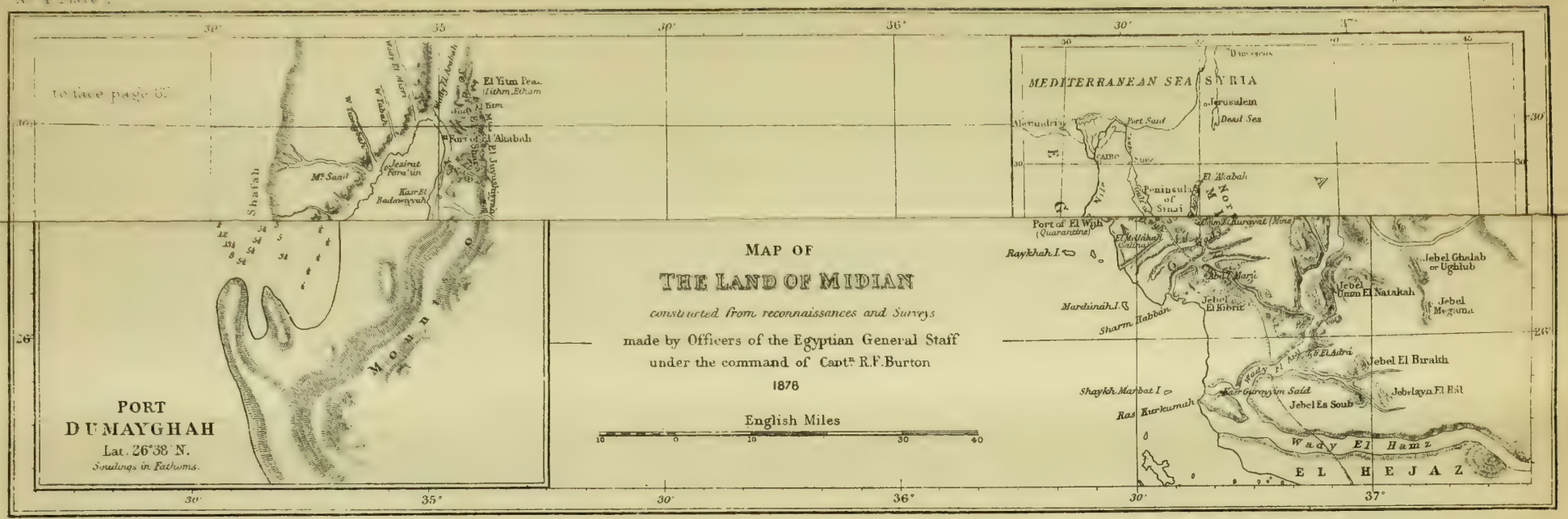
Topographically speaking the whole tract is a prolongation of the great Hauranic Valley (Auranitis); of the land of Moab; of the Nejeb or south country; of Idumæa, which the Hebrews called Edom, and of the classical Nabathæa, whose western capital was Petra, the Rock. Like those regions lying east and south-east of the Jordan Valley and the Dead Sea, regions once so populous and powerful, and now very types of the abomination of desolation, Midian is, and ever has been, inhabited by a mixed and kindred race of citizens and Bedawin. The former would naturally affect the seaboard; hence even in the days of Moses (B.C. 1452) we find that the maritime country had its "cities and goodly castles" (Num. xxxi). The wild men, who wandered about the interior, are still what they always were Scenitæ, tent-dwellers. Thus the learned Mr. Fergusson opines (p. 25, "The Temples of the Jews, &c.," London, Murray, 1878) that "the Tabernacle may have had its origin from

some sacred tent of the Arabs of Midian." Moses, who was connected by marriage with the ruler of the land, would naturally have borrowed, from his country of refuge, the idea of the Pavilion, which developed itself into the Temple of Solomon.

The Land of Midian must also have been influenced by the great line of transit and traffic, which ran through its length from south to north. Strabo (xvi. c. 4, § 24) shows that, about the beginning of the Christian era, this main road, subtending the coast, was one of the earliest of "Overlands." The merchandize of India and of southern Arabia was landed at the southernmost Nabathæan port, Leuke Kome (Λευκὴ Κώμη), the "White Village," whose name translated survives in *El-Haurá*. The fine port lies in N. lat. 25° .6′, about the same parallel as El-Medinah, and in E. long. 37° 13′ 30″ (Gr.) Here, before the Nile route to Alexandria was opened, merchants disembarked their goods, preferring the long and toilsome camel-journey to the dangerous ship-voyage northwards; and, reaching Petra, the imports were passed on to Phœnicia and Egypt. The remains of the eighteen cities and towns discovered by the two Khedivial expeditions, all lie upon or near this ancient "Overland," and the country appears to have been equally rich in commerce, in agriculture and in minerals.

Considering her position, then, ancient Midian would adopt the style of building chosen by the races that lived, under similar conditions, on her northern frontier. And we have an excellent point of comparison in the Nejeb (Negeb), called in the days of Abraham (*Gen.* xx. 1) the "South Country," because the Holy Land lay to the north of it. This tract has been opened to us by the late Rev. E. Wilton ("The Negeb, or the South Country," London, 1863), and pictorially by the journey of Messrs. Tyrwhitt-Drake, and Palmer. Part II. of "The Desert of the Exodus" (E. H. Palmer, M.A., London, Bell and Daldy, 1871), contains a long and trustworthy description of this interesting region. The illustrations, *mutato nomine*, might serve for Midian, especially those of El-'Aujeh, of Kharábat Lussán (p. 346), of the "Muweileh" Cairns (p. 354), and of the ancient fort of "El-Meshrifeh" (p. 371). Midian, it is true, can show few remains of building to be compared with the ruined houses and the town gateway of Sebaita-Zephath (pp. 360, 375), or the "interior of church at El-'Aujeh" (p. 369), while her catacombs are far from equalling those of the Capital, Petra. On the other hand her shafts and galleries are superior in science to the stone quarry at El-'Aujeh (p. 366); and her classical shrine or temple at the southernmost limit has no rival known to us in the "South Country." The destruction of buildings in both regions is probably synchronous. "The history of the Christian Church of the Negeb," says Professor Palmer (p. 377), "is now quite lost, but it is more than probable that it perished either under the invasion of the Persian Khosroes, or that of the Caliph Omar." The same effects may have extended to Midian under the conquering Sassanian king, Khusrau Anúshírawán (A.D. 531-579), or when 'Omar and his successors sent forth the various expeditions which began in A.D. 650. But here it would appear there was a second period of destruction; and that evidently dates from the early 16th century, when Sultan Selim laid down his maritime road for the pilgrim-caravans. As regards the precious metals, it is my opinion that they have been worked, more or less, up to the present day.

And yet another preliminary,—the building material supplied by the maritime country and the subtending mountains. In this point the Midianite architects were peculiarly fortunate. A vast formation of the Secondary Period, which ran along the seaboard and even extended into the "Sinaitic Peninsula," supplied them with an abundance of limestone. For their temples, palaces and houses they had the finest *Rughám* (alabaster), plain and variegated; while the gypsum served as cement. I have deposited in the British Museum a noble specimen of *Rukhám* (white saccharine marble) from the Jebel El-Lauz or Almond Mountain. Equally abundant are the grits; and the new



W. J. Turner, Del.

MEDITERRANEAN SEA
SYRIA
NUBIA
ABYSSINIA
GULF OF ADEN
RED SEA
EL HEJAZ
PORT DUMAYGHAH
Lat 26°38 N.
MAP OF
THE LAND OF MIDIAN
constructed from reconnaissances and surveys
made by Officers of the Egyptian General Staff
under the command of Capt.n R.F Burton
1878
English Miles

red sandstone of the Hismá, or inner region, is self-faced, built in places like natural brick-work. The Ghâts and submaritime chains consist of porphyritic traps, red and green; and of close hard granites containing little mica: the degradation of the latter yields a felspathic or kaolin clay which makes admirable fire bricks. The granites are almost everywhere cut by veins of quartz, showing all varieties of colour, and trending in all directions. This rock, which is richest in ore at its junction with the containing primaries, is the characteristic of the country. Here it whitens the valleys and lowlands that look as if snow had freshly fallen; there it rises in rounded cones which number hundreds of feet in height. Details concerning building material will occur in the course of description. Suffice it now to say that it is found in three several states; either artificially cut, or self-faced, or in water-rolled blocks and boulders.

These preliminaries finished, we may now proceed to the actual remains of building in Midian. For the convenience of my hearers I will begin, with the beginning, at the Fort of El-'Akabah, and treat in Section I. of the ruins of North Midian. Thence proceeding southwards I will notice the principal features of the southern division, ending where the great Wady Hamz forms the junction between the Egyptian Province and El-Hejaz, the Holy Land of the Moslems, now subject to the Porte. In order to save time I shall pass lightly over the minor details and enlarge chiefly on the remains of the Midianite capital and the temple on the southern frontier. And to spare you mortification of *crambe repetita* I shall be chary of matter already published in my prefatory volume, "The Gold Mines of Midian" (C. Kegan, Paul and Co., London, 1877); and draw freely upon my coming book, "The Land of Midian," which will be of a more popular nature.

Ruins in North Midian.

The fort and settlement of El-'Akabah, at the head of the dangerous gulf, similarly named, have been described by a host of travellers. I do not remember, however, that anyone has noticed the traces of the ancient Elath or Eloth, which lies at the very head of the bay, and which evidently extended all round the chord from the north-east to north-west. This part is called El-Dár (the house) and it was the halting place of the pilgrim-caravans before New 'Akabah was founded; the principal remains are large blocks of cut stone covered by sea water which here is of the clearest. Inland and to the north rise the mounds and tumuli, the sole remains of ancient Elath, once the port of Petra, which is distant only two dromedary marches. A line of larger heaps further north shows where, according to the people, ran the city wall; finding it thickly strewed with scoriæ, old and new, I decided that this was the *Siyághah*, mint or smiths' quarter. Between it and the sea the surface is scattered with glass, shards, and slag; the metal treated was probably native copper from the Sinaitic Jebel and Wady Raddádi. Of this "chrysocolla" a specimen has been deposited in the British Museum.

About seven miles distant from El 'Akabah, and close to the western or Sinaitic shore, lies the "Pharaoh's Isle:" the natives know it as the *Jebel el-Kala'h*, or fort-hill. The bit of rock is a saddleback with pommel and cantle well defined; the material is grey granite quartz-veined and dyked with decaying porphyritic trap; and the ground-plan is a long oval of about 320 by 152 mètres. Here we made careful plans, drawings and photographs; there is, however, nothing novel in the castle which was described by Rüppell in 1826, and by Wellsted in 1838. Suffice it to say, that we found several strata of building. The mass is evidently European, built during the days when the Christians and the Crusaders held El-'Akabah. Apparently it rests upon Roman ruins, and the latter, perhaps, upon Egyptian remains of far older date. I can assign no period to the rock-hewn cisterns. The upper part of the fortification is attributed by popular legend to the reign

of Saláh el-Dín (Saladin) who, in A.D. 1167, cleared El-'Akabah of the infidel invader by carrying ships on camel back from Cairo. Later generations of thieves, pirates, and fishermen made it their refuge and abode; and thus the uppermost masonry and the embrasures are rude in the extreme.

Steaming southwards along the eastern side of the 'Akabah Gulf, we pass some unimportant ruins, the "Girl's Palace," the "Bedawi's Castle," and the remains of El-Hakl (popularly pronounced El-Hagul), the Ἀγκάλη (Ancale) of Ptolemy. A second islet off this shore is said to contain the "Palace of the Bedawi Woman;" and inland there are signs of a *Mashghal* or "atelier" where metal was worked in a mountain known as Tayyib Ism—of the "good name." After finishing the northern two-thirds of the gulf we land at Makná, and enter upon a highly interesting section of Midian.

Makná, also called by the people "Madyan," is evidently the Μάκνα, Μαΐνα or Μαήνα which Ptolemy (vi. 7, sect. 27) places in N. lat. 28° 45′, the true being 28° 23′. It is evidently the port of the Midianite capital, and the site of an important mining industry. But it will hardly bear more description. Dr. Beke visited it in 1874; and the fine volume lately edited by his widow contains a plan of the so-called "Praying-place of Moses." In my first book (The Gold Mines of Midian, &c.) I have given a full account of its remains. It is a charming site, with an abundance of water in the Wady-bed, and a flood of verdure, dates, daum-palms, and other trees, surging up and streaming down the high dry sandbanks which form the narrow "gate" or valley-mouth.

The road to the capital lies up this huge Fiumara, which is known to the Arabs as Wady Makná or Wady Madyan. A march of 17½ miles east with some five miles of northing leads to its head, where a shallow wave of ground divides it from the Wady 'Afál, alias the Wady El-Bada'. The latter Fiumara shows both banks lined with courses of rough stone, mostly rounded and water-rolled boulders, evidently the ruins of the conduits which served to feed the rich growth of the lower valley.

This place is evidently the capital of Madyan Proper, the Μαδιάμα which Ptolemy (vi. 7 sec. 27) places amongst his Mesogeian towns in N. lat. 28o 15′ with little error (true 28° 28′). The Bedawin, faithful to their tradition, call it *Maghâir Shu 'ayb*, "Caves" (or catacombs) "of the Prophet Jethro," who used to winter at this place and wander seawards in the date-season.

The ruins, of large extent for North Midian, and equal to those of all the towns we have seen put together, begin with a palm-orchard on the left bank. The Jebel el-Safrá, a mass of gypsum, shows the foundations of what may have been the *arx*. It is a double quoin, the taller to the south, the lower to the north, and both bluff in the latter direction. The dip is about 45 deg.; the upper parts of the dorsa are scatters of white on brown-yellow stone; and below it, where the surface has given way, appear mauve-coloured strata, as if stained by manganese. Viewed in profile from the west, the site of *El-Muttali'*, as the Arabs call the "Hauteville," becomes a tall, uptilted wedge, continued northwards by the smaller feature, and backed by a long sky-line, a high ridge of plaster, pale coloured, with glittering points.

This isolated "Yellow Hill," a "horse" in Icelandic parlance, rising about two hundred feet above the valley-sole, is separated by a deep, narrow gorge from the adjacent eastern block. The slopes, now water-torn and jagged, may formerly have declined in regular lines; and evidently all were built over to the crest like those of Syrian Safet. The foundations of walls and rock-cut steps are still found even on the far side of the eastern gut. The knife-back is covered with the foundations of what appears to have been a fortified monastery or palace; a straight street or passage running north-south, with five deg. west (mag.). It serves as base for walls one mètre and a half thick, opening upon it like rooms: of these we counted twenty on either side. At the northern end of the ridge, which, like the southern, has been weathered to a mere spur, is a work composed of two semicircles fronting to the north and east. A bastion of well-built wall in three straight lines overhangs the perpendicular

face of the eastern gorge; in two places there are signs of a similar defence to the south, but time and weather have eaten most of it away. The ground sounds hollow, and the feet sink in the crumbling heaps: evidently the whole building was of *Rugham* (alabaster or gypsum); and in the process of decay it has become white as blocks of ice, here and there powdered with snow.

On the narrow, flat ledge, between the western base of the *Safrá* and the eastern side of the Bada' valley, lie masses of ruin now mere rubbish; bits of wall built with cut stone, and water-conduits of fine mortar containing, like that of the Pyramids, powdered brick and sometimes pebbles. We carried off a lump of sandstone bearing unintelligible marks, possibly intended for a man and a beast. We called it "St. George and the Dragon," but the former is afoot—possibly the Bedawin stole his steed. There was a frustum or column-drum of fine white marble, hollowed to act as a mortar; like the Moslem headstone of the same material, it is attributed to the Jebel el-Lauz, where ancient quarries are talked of. There were also *Mahrákah* ("rub-stones" for grain) of close-grained red syenite, and fragments of the basalt hand-mills used for quartz-grinding. Part of a mortar was found, made of exceedingly light and porous lava.

South-east of the Hauteville falls in the now rugged ravine, *Khashm el-Mutalli'*, "Snout of the high" (town). It leads to the apex of the coralline formations, scattered over with fragments of gypsum, here amorphous, there crystalline or talc-like, and all dazzling white as powdered sugar. Signs of tent-foundations and of buildings appear in impossible places; and the heights bear two Burj or watch-towers, one visible afar, and dominating from its mamelon the whole land. The return to the main valley descends by another narrow gorge further to the south-east, called *Sha'b el-Darak*, or "Strait of the Shield:" the tall, perpendicular, and overhanging walls, apparently threatening to fall, would act *testudo* to an Indian file of warriors. High up the right bank of this gut we saw a tree-trunk propped against a rock by way of a ladder for the treasure-seeker. The Sha'b-sole is flat, with occasional steps and overfalls of rock, polished like mirrors by the rain-torrents; the mouth shows remains of a masonry-dam some fourteen feet thick by twenty-one long; and immediately below it are the bases of buildings and watercourses.

Walking down the left bank of the great Wady, and between these secondary gorges that drain the "Yellow Hill," we came upon a dwarf mound of dark earth and rubbish. This is the *Siyághah* (mint and smiths' quarter), a place always to be sought, as Ba'lbak and Palmyra taught me. Remains of tall furnaces were scattered about, and here upon the surface and below it, but not more than one foot deep, were found the coins of Midian for the first time *in situ*.

Beyond the Siyághah, the left bank is gashed by the ravines draining the south-eastern prolongation of the "Yellow Hill." Water cuts through this rotten formation of rubbish like a knife into cheese; forming deep chasms, here narrow, there broad, with walls built up, as it were, of fragments, and ready to be levelled by the first rains. The lines of street and the outlines of tenements can be dimly traced; while revetments of rounded boulders show artificial watercourses and defences against the now dried-up stream. The breadth of this, the eastern settlement, varies with the extent of the ledge between the gypsum-hills and the sandy Wady; the length may be a kilomètre. The best preserved traces of crowded building end with the south-eastern spur of the Jebel el-Safrá. Beyond them is a huge cemetery. The ancient graves are pits in the ground; a few still uncovered, the many yawning wide, and all of them ignoring orientation. Those of the moderns, on the contrary, front towards Meccah. The Bedawin of this country seem ever to prefer for their last homes the most ancient sites; they place the body in a pit, covered with a large slab or a heap of stones, but they never fill in the hollow, as is usual among Moslems, with earth. The arrangements suit equally well the hyena and the skull-collector; and thus I was able to make a fair collection of Bedawi crania.

At the south-eastern end of the outliers projected by the Jebel el-Safrá, where a gentle slope of red earth falls towards the valley bank, is the only group of buildings of which any part is still standing. The site may be old, but the present ruins are distinctly mediæval, dating probably from the days of the Egyptian "Mameluke Sultans." Beginning from below and to the south-west is a *Hauz*, or cistern, measuring twenty-six by nineteen and a half mètres, with a depth of nine or ten feet. The material is cut sandstone, cemented outside with mortar containing the normal brick-crumbs and pebbles, and inside mixed with mud. At the north-eastern and south-western corners are retaining buttresses in two steps, exactly like those in the inland fort of El-Wijh: at the two other angles are flights of stairs; and the sole is a sheet of dried silt. To the south-east lies the remnant of a small circular furnace, and on the north-north-east a broken wall shows where stood the *Bayt el-Saghir*, or smaller reservoir. A narrow conduit of cut stone leads, with elaborate zigzags, towards two *Sákiyah* ("draw-wells") hollowed in the gypsum. The southern, an oval of five mètres ten centimètres, is much dilapidated; and its crumbling throat is spanned by a a worn-out arch of the surrounding Secondary rock. Close to the north-west is the other, revetted with cut stone, and measuring six mètres in diameter. It is an elaborate affair, with a pointed arch and a regular keystone; circular *Sadúd*, or "walls for supporting the hauling-apparatus;" and minor reservoirs numbering three. On a detached hillock, a few paces to the north, stands the fort which defended the establishment. The short walls of the parallelogram measure fifteen mètres forty centimètres; and the long, eighteen mètres sixty centimètres; the gate, choked by ruins, leads to a small hall, with a masked entrance opening to the right. There is a narrow room under the stone steps to the west, and two others occupy the eastern side. This fort is to be restored for the better protection of pilgrims; and shortly after our departure an Egyptian engineer, Sulayman Effendi, came from Suez to inspect and report upon it.

According to local modern tradition this scatter of masonry was the original site of the settlement, called after the builder *Bir el-Sa'ídani*—the "Well of Sa'ídán." For watering each caravan the proprietor demanded a camel by way of fee; at last a Maghribí—that is, a magician—refused to "part;" betook himself to the present camping ground, sank pits, and let loose the copious springs. The old wells then dried up, and the new sources gave to this section of the great Wady 'Afál its actual name, *Wady el-Bada'*—"of the innovation," so hateful to the conservative savage. Hence Rüppell's "Beden," which would mean an ibex.

On the opposite or right bank of the broad and sandy bed, the traces of ancient buildings extend to a far greater distance—at least to two kilomètres. They have been a continuous line of forts, cisterns, and tenements, still marked out by the bases of long thick walls; the material is mostly gypsum, leprous-white as the skin of Gehazi. But here, and indeed generally throughout Midian, the furious torrents, uncontrolled during long ages by the hand of man, have swept large gaps in the masses of homestead and public buildings. Again the ruins of this section are distributable into two kinds—the City of the Living, and the City of the Dead.

The former, of considerable extent, hugs the watercourse, and crowns all the natural spurs that buttress the bed. Beginning from the north lie two blocks of building considerable in extent: the southern, called by the Arabs *El-Malká*, is a broken parallelogram. Further down stream the bank is a vast strew of broken pottery; and one place, covered with glass fragments, was named by our soldiers *El-Khammárah*—"the tavern" or "the hôtel." As in ancient Etruria, so here, the people assemble after heavy rains to pick up what luck throws in the way. It is said that they often gather gold pieces, square as well as round, bearing by way of inscription "prayers" to the Apostle of Allah. Some of us, however, had a shrewd suspicion that the *Tibr*, or "pure gold-dust," is still washed from the sands, and cast probably in rude moulds.

Behind, inland or westward of this southern town, lies the City of the Dead. Unlike the pitted graveyard to the north-east, the cemetery is wholly composed of catacombs, which the Bedawin call *Maghâir* ("caves") or *Bibân* ("doors"). The sites are the sides and mouths of four little branch-valleys which cut through the hillocks representing the Wady-bank. The northernmost is known as *Wady el-Khurayk*, because it drains a height of that name; the others bear the generic term *Wady el-Safrá*, so called, like the *hauteville* hill, from the tawny yellow colour of the rocks. The catacombs, fronting in all directions, because the makers were guided by convenience, not by ceremonial rule, are hollowed in the soft new sandstone underlying the snowy gypsum; and most of the façades show one or more horizontal lines of natural bead-work, rolled pebbles disposed parallely by the natural action of water. In the most ruinous, the upper layer is a cornice of hard sandstone, stained yellow with iron and much crevice'd; the base, a soft conglomerate of the same material, is easily corroded, and the supernal part caves in upon the principle which is destroying Niagara. At each side of the doorways is a *Mastabah* ("stone bench"), also rock-hewn, and with triple steps. The door-jambs, which have hollowings for hinges and holes for bars, are much worn and often broken; they are rarely inclined inwards after the fashion of Egypt. A few have windows, or rather port-holes, flanking the single entrance. The peculiarities and the rare ornaments will be noticed when describing each receptacle: taken as a whole, they are evidently rude and barbarous forms of the artistic catacombs and tower-tombs that characterise Petra and Palmyra.

The *Maghâir* may roughly be divided into four topical groups. These are—the northern outliers; the "Tombs of the Kings," so called by ourselves because they distinguish themselves from all the others; the "buttressed caves" (two sets); and the southern outliers. The first mentioned begin with a ruin on the right jaw of the Khurayk gorge: it is dug in sandstone strata, dipping, as usual, from north-west to south-east; it faces eastward, and the entrance declines to the south. All external appearance of a catacomb has disappeared: a rude porch, a frame of sticks and boughs, like the thatched eaves of a Bulgarian hut, stands outside, while inside evident signs of occupation appear in hearths and goat-dung, in smoky roof, and in rubbish-strewn floor. Over another ruin to the west are deeply cut *graffiti*, of which squeezes and photographs were taken; there are two loculi in the southern wall, and in the south-eastern corner is a pit, also formerly containing a sarcophagus. In a hill-side to the south of this cave is another, dug in the *Tauá* or coloured sandstone, and apparently unfinished; part of it is sanded up, and its only yield, an Egyptian oil-jar of modern make, probably belonged to some pilgrim. Crossing the second dwarf gorge we find, on the right bank, a third large ruin of at least fourteen loculi; the hard upper reef, dipping at an angle of 30 deg., and striking from north-west to south-east, fell in when the soft base was washed away by weather, and the anatomy of the graves is completely laid bare. Higher up the same Wady is a fourth "Maghárah," also broken down; the stucco-coating still shows remnants of red paint, and the characters TI—possibly Arab "Wasm," or tribal marks—are cut into an upright entrance-stone.

The precipitous left bank of the third gorge contains the three finest specimens, which deserve to be entitled the "Tombs of the Kings." Of these, the two facing eastward are figured by Rüppell (p. 220) in the antiquated style of his day, with fanciful foreground and background. His sketch also places solid rock where the third and very dilapidated catacomb of this group, disposed at right angles, fronts southwards. Possibly the façades may once have been stuccoed and coloured; now they show the bare and pebble-banded sandstone.

The southernmost, which may be assumed as the type, has an upright door, flanked by a stone bench of three steps. Over the entrance is a defaced ornament, which may have been the bust of a man; in Rüppell it is a kind of geometrical design. The frontage has two parallel horizontal lines,

raised to represent cornices. Each bears a decoration resembling crenelles or Oriental ramparts broken into three steps; the lower set numbers eight, including the half ornaments at the corners, and the higher seven. The interior is a mixture of upright recesses, probably intended for the gods or daimons; and of horizontal loculi, whose grooves show that they had lids. There is no symmetry in the niches, in the sarcophagi, or in the paths and passages threading the graves. The disposition will best be understood from the ground-plans drawn by the young Egyptian officers; their sketches of the façades are too careless and incorrect for use, but the want is supplied by the photographs of M. Lacaze.

Above these three "Tombs of the Kings" are many rock-cavities which may or may not have been sepulchral. Time has done his worst with them. We mounted the background of quoin-shaped hill by a well-trodden path, leading to the remnants of a rude Burj (watch-tower), and to a semicircle of dry wall garnished with a few sticks for hanging rags and tatters. The latter denotes the *Musallat Shu'ayb*, or Praying-place of (Prophet) Jethro; and here our guides took the opportunity of applying for temporal and eternal blessings. The height at the edge of the precipice which, cliffing to the north, showed a view of our camp and of Yubú' and Shu'shú' Islands, was in round numbers 450 feet (aner. 29·40—28·94). From this vantage-ground we could distinctly trace the line of the Wady Makná, beginning in a round basin at the western foot of the northern Shigd Mountain and its sub-range; while low rolling hills, along which we were to travel, separated it from the Wady Bada'-'Afál to the south.

Two other important sets of catacombs, which I have called the "buttressed caves," are pierced in the right flank of the same gorge, at the base of a little conical hill, quaintly capped with a finial of weathered rock. The material is the normal silicious gravel-grit, traversed and *cloisonné* by dykes of harder stone. Beginning at the south, we find a range of three, facing eastward, and separated from one another by flying buttresses of natural rock. No. 1 has a window as well as a door. Next to it is a square with six open loculi ranged from north to south. No. 3 shows a peculiarity—two small pilasters of the rudest (Egyptian?) "Doric," the only sign of ornamentation found inside the tombs; a small break in the south-western wall connects it with the northernmost loculus of No. 2. Furthest north are three bevel-holes, noting the beginning of a catacomb; and round the northern flank of the detached cone are six separate caves, all laid waste by the furious boreal gales.

The second set is carved in the bluff eastern end of an adjoining reef that runs away from the Wady; it consists of four sepulchres with the normal buttresses. They somewhat resemble those of the Kings, but there are various differences. No. 2 from the south is flanked by pilasters with ram's-horn capitals, barbarous forms of "Ionic" connected by three sets of triglyphs. The pavement is of slabs; there is an inner niche, and one of the corners has been used as an oven. On a higher plane lies a sunken tomb, with a deep drop and feet-holes by way of ladder; outside it the rocky platform is hollowed, apparently for graves. The other three façades bear the crenelle ornaments; the two to the north show double lines of seven holes drilled deep into the plain surface above the door, as if a casing had been nailed on, while the northernmost yielded a fragmentary inscription on the southern wall. These are doubtless the "inscribed tablets on which the names of kings are engraved," alluded to in the Jihan-numá of Haji Khalifah.* Rounding the reef to the north, we found three catacombs in the worst condition; and of these, one shewed holes drilled in the façade.

The southern outliers lie far down the Wady 'Afál, facing east, and hewn in the left flank of a dwarf gulley which falls into the right bank not far from the site called by our men "the tavern."

* Wellsted, vol. ii., Appendix.

The group numbers three, all cut in the normal sandstone, with the harder dykes which here stand up like ears. The principal item is the upper cave, small, square, and apparently still used by the Arabs; in the middle of the lintel is a lump looking like the mutilated capital of a column. The two lower caves show only traces.

There is a tradition that some years ago a Frank (Rüppell?), after removing his Arab guides, dug into the tombs, and found nothing but human hair. Several of the horizontal loculi contained the bones of men and beasts; I did not disturb them, as all appeared to be modern. The floors, sounding hollow underfoot, gave my companions hopes of "finds;" but I had learned, after many a disappointment, how carefully the Bedawi ransack such places. We dug into four sepulchres, including the sunken catacomb and the (southern) inscribed tomb. Usually six inches of flooring led to the ground-rock; in the sarcophagi about eight inches of hard tamped earth was based upon nine feet of sand that ended at the bottom. The only results were mouldering bones, bits of marble and pottery, and dry seeds of the Kaff Maryam, the well-known rose of Jericho (*anastatica*), which here feeds the partridges, and which in Egypt supplies small children with medicine and expectant mothers with a charm. The cave also yielded well-developed specimens of bats (*rhinopoma*), with long spiky tails.

I have described at considerable length this ruined Madiáma, which is evidently the capital of Madyan Proper, ranking after Petra. In one point it is still what it was, a chief station upon the highway, then Nabati, now Moslem, which led to Petra, *viâ* the Ghor or Wady el-'Arabah.

From the capital of Midian Proper, which is surrounded by *ateliers* and other ruinous outliers, we make our way to the sea shore; and, still going south, we visit the three pilgrim-stations—'Aynúnah, Sharmá, and Tiryam. The former is the Ὄννη which Pliny places in north latitude 28°40′ (true 28° 2′ 30″). The other two must have had classical names, but these are now forgotten. Perhaps one of them may be the Μοδίανα, or Μοδοῦνα (Arab., Mudun, the Cities?) of Ptolemy (north latitude 27° 45′). 'Aynúnah gave us the impression of having been the great *Warshah* ("workshop") and shipping-place of the coast-section extending from El-'Akabah to El-Muwaylah, upon which depended both Sharmá and Tiryam, with their respective establishments in the interior. Dr. Beke touched here in 1874; but, like his predecessor, Rüppell, he seems not to have noticed any signs of mining industry. Yet the condition of the slags and firebricks convinced me that iron and the baser metals have been worked in modern times, perhaps even in our own; by whom, however, I should not like to say.

I can add little to the description of 'Aynúnah given in "The Gold Mines of Midian." There you may read of the maritime settlement and its extensive waterworks, well cemented cisterns, and an aqueduct three miles long built of rough stone and excellent cement, and lined along the water-way with broad, carefully-baked and eared tiles. The mortar, as usual throughout Midian, was mixed with small pebbles and crumbs of brick—you have seen the same in the Pyramids of Egypt. The aqueduct, which is all subaërial, heads in a groove of the rock where the mouth of the Wady breaks through the coralline cliffs forming the old shore. This gorge, which the Arabs call the *Báb* (gate), is some 200 mètres in width: a *barrage* of rough stone set in excellent cement collected the upper waters into a lake, and at the head of the latter stood a double row of furnaces. The ore was collected probably by slaves, whose little huts were built upon the cliff overlooking the dam; and in the slope below, a vein of silicate of copper, which the Arabs called *fayrúz* (turquoise), had been carefully worked out. And this throughout maritime Midian appears to have been the general disposition of the settlements. The wealthy mine owners affected the seaboard; the miner-slaves were placed near the works.

Sharmá lies about seven miles south of 'Aynúnah. During my first expedition we had found, upon the right jaw of its Wady, a ruined village of workmen, whose *bothans* measured some twelve feet by eight. They differ from the Nawámis, or "mosquito-huts," as the word is generally translated, only in shape—the latter are circular, with a diameter of ten feet—and they perfectly resemble the small stone hovels in the Wady Mukattab, which Professor Palmer ("Desert of the Exodus," p. 202) supposes to have been occupied by the captive miners and their military guardians. This time we ascended the coralline ridge which forms the left jamb. At its foot a rounded and half-degraded dorsum of stiff gravel, the nucleus of its former self, showed a segment of foundation-wall, and the state of the stone suggested the action of fire. Possibly here had been a furnace. The summit also bears signs of human occupation. The southern part of the buttress-crest still supports a double concentric circle with a maximum diameter of about fifteen feet; the outside is of earth, apparently thrown up for a rampart behind a moat, and the inside is of rough stones. Going south along the dorsum, we found remains of oval foundations; a trench apparently cut in the rock, pottery often an inch and more thick, and broken hand-mills made of the New Red Sandstone of the Hismá. Finally, at the northernmost point, where the cliff-edge falls abruptly, with a natural arch, towards the swamp, about one kilomètre broad at the "*Báb*," we came upon another circle of rough stones. We were doubtful whether these rude remains were habitations or old graves; nor was the difficulty solved by digging into four of them: the pick at once came upon the ground-rock. Hitherto these ruins have proved remarkably sterile; the only products were potsherds, fragments of hand-mills, and a fine lump of white marble.

At Wady Tiryam I set the quarrymen to work, with pick and basket, at the north-western angle of the old fort. The latter shows above ground only the normal skeleton-tracery of coralline rock, crowning the gentle sand-swell, which defines the lip and jaw of the Wady, and defending the townlet built on the northern slope and plain. The dimensions of the work are fifty-five mètres each way. The curtains, except the western, where stood the *Bab el-Bahr* ("Sea gate"), were supported by one central as well as by angular bastions; the northern face had a cant of 32 deg. east (mag.), and the north-western tower was distant from the sea seventy-two mètres, whereas the south-western numbered only sixty. The spade showed a substratum of thick old wall, untrimmed granite, and other hard materials. Further down were various shells, especially *bénitiers* (*Tridacna gigantea*), the harp (here called "Sirinbáz"), and the pearl-oyster; sheep-bones and palm-charcoal; pottery admirably "cooked," as the Bedawin remarked; and glass of surprising thinness, iridized by damp to rainbow hues. This, possibly the remains of lachrymatories, was very different from the modern bottle-green, which resembles the old Roman. Lastly, appeared a ring-bezel of lapis lazuli; unfortunately the "royal gem" of Epiphanus was without inscription.

We now reach Fort El-Muwaylah, which I have mentioned as marking the southern frontier of Madyan Proper. The learned Arabist and traveller, Dr. Wallin, or as the Arabs called him Háji Wali, considered the settlement a modern growth, in fact the outcome of the Egyptian pilgrimage. Had he looked two feet beyond the north-eastern town of the fort, he would have found long forgotten vestiges of ovens, and slags containing copper and iron. About one mile and three-quarters up the Wady Surr, the Nullah on whose right bank stands the settlement, he would have seen another ruin which the people term *Abú Hawáwít* ("Father of Dwelling Walls.") The site is a holm, or islet, in the bed which here runs east-west and splits; the main line is the southern, and a small branch, a mere gulley, occupies the northern bed-side. The chief ruin is an oblong of twenty mètres by sixteen, the short ends facing 195 deg. (mag.); the whole built of huge pebbles. The interior is composed of one large room to the north, with sundry smaller divisions to the south, east, and west.

Defence was secured by a wall, distant 142 mètres, thrown across the whole eastern part of the islet: outside it are three large pits, evidently the site of cisterns. The people also told us of a well, the *Bir el-Ashgham*, which has long been mysteriously hidden. Immense labour has also been expended in revetting the northern and southern banks, both of the islet and the smaller branch-bed, for many hundreds of yards, with round and water-rolled boulders, even on a larger scale than at Magháir Shu'ayb. What all this work meant we are unable to divine. Perhaps it belonged to the days when the sea-board of Midian was agricultural; and it was intended as a protection against the two torrents, the Wadys *el-Zila'* and *Abú Zabah*, which here fall into the northern bank.

Ruins in South Midian.

The mining of the north country, to judge from the ruins, was confined to copper smelting and to spalling the quartz which was treated in the several establishments, notably at 'Aynúnah. In the section which we are about to visit, the remains, as will be seen, were much more considerable, and gold appears to have been the metal principally worked.

From El-Muwaylah a run of twenty direct miles southwards places us at the little port of Zibá, in north latitude 27° 20′. I have described this place in "The Gold Mines of Midian" (chap. xi.); in "The Land of Midian" (re-visited) I shall give my reasons for holding it to be the Φοινίκων κώμη (Phænicon vicus) of Ptolemy. The old town stood immediately behind, or inland of, the modern settlement, and its stones, buried for ages under the sand, are now dug up to build its successor. To the north-east of it lies the Jebel El-Ghál where the best turquoises are found; and to the east is a mining station called "Umm Ámil." It had been grandiosely described to me during my first visit, and I was somewhat disappointed to see a few worthless heaps of water-rolled stones. Our caravan entitled it "El-Lomán"—the bagnio, the prison for galley-slaves.

A three day's ride from Zibá to the east-south-east places the traveller at Shuwák (north latitude 27° 15′). It can be no other than the Σόακα of Ptolemy, a large and important station on the great Nabathæan "Overland." The site is a long island in the broad and sandy Wady Shuwák; at the ruins the bend of the valley is from north-east to south-west, and the altitude is about 1700 feet.

We will begin at the Wady-head, and note the ruins as we stroll down. This section, Shuwák proper, is nearly a mile and a-half long, and could hardly have lodged less than twenty thousand souls. But that extent by no means represents the whole; our next march will prolong it along the water-course for a total of at least four miles. The material is various—boulders of granite and syenite; squares of trap and prophyry; the red sandstones of the Hismá; the basalts of the Harrah; and the rock found *in situ*, a brown and crumbling grit, modern, and still in process of agglutination. The heaps and piles which denote buildings are divided by mounds and tumuli of loose friable soil, white with salt, miniatures of Babylon, Nineveh, and Troy. On the right side we find a large fort, half sliced away by the torrents, but still showing the concrete flooring of a tower. About the centre of the length are the remnants of a round "Burj;" blocks of buildings, all levelled to the foundations, lie to the north-west, and on the west appear signs of a square. Perhaps the most interesting discovery is that of catacombs, proving a civilization analogous to that of Magháir Shu'ayb, but ruder, because more distant from the centre. The "caves" are hollowed in a long reef of loose *breccia*, which, fronting eastward, forms the right bank of the smaller branch. They are now almost obliterated by being turned into sheep-folds; the roofs have fallen in, and only one preserves the traces of two loculi.

The arrangements touching fuel and water in this great metal-working establishment are on a

large scale. The biggest of the *Afrán* ("furnaces") lies to the north-west, near the right bank of the valley: all are of the ordinary type, originally some five or six feet high, to judge from the bases. They are built of fire-brick, and of the Hismá stone, which faces itself into a natural *latex*. We dug deep into several of them; but so careful had been the workmen, or perhaps those who afterwards ransacked these places, that not the smallest tear of metal remained: we found only ashes, pottery, and scoriæ, as usual black and green, the latter worked sub-aërially; many of them had projections like stalactites.

Water had been stored with prodigious labour. We traced the lines of half-a-dozen aqueducts, mostly channelled with rough cement, overlying a fine concrete: some of them had stones grooved to divert the stream by lashers. The *Fiskíyyah* or "tanks" were of all sizes; and the wells, which appeared to be mediæval, were lined with stones cut in segments of circles. The greatest feat is an aqueduct which, sanded over in the upper part, subtends the left side of the valley. It is carefully but rudely built, and where it crosses a gully, the arch is of the Egyptian or Etruscan type, which Mr. Fergusson calls the "horizontal;" that is, formed of projecting stone tiers, without a sign of the key. This *magnum opus* must date from the days when the southern part of the Wady was nearly what it is now.

About a mile and a quarter below our camp, the Wady, which broadens to a mile, shows on the left bank a wall measuring a thousand mètres long, apparently ending in a tank of 110 feet each way. Around it are ruined parallelograms of every size, which in ancient times may have been workshops connected with the buildings in the island higher up. The torrents have now washed away the continuation, if ever there was any; and, though the lower remnants are comparatively safe upon their high ledge, the holm is evidently fated to disappear.

We left Shuwák considerably posed, puzzled, and perplexed by what it had shown us. A little pottery had been picked up, but our diggings had not produced a coin or even a bit of glass. The evidences of immense labour are the more astonishing when compared with the utter absence of what we call civilization. The Greek and Latin inscriptions of the Hauranic cities declare their origin; these, absolutely analphabetic, refuse a single hint concerning the mysterious race which here lived and worked, and worked so nobly. And, finally, who were the Moslems that succeeded them in a later day, when the Hajj-caravan, some three centuries and a-half ago, ceased to march by this road? How is it that the annalists say nothing of them? that not a vestige of tradition remains concerning any race but the Nazarenes?

After marching some seven miles from Shuwák with westing, you come upon formless heaps to the left. Half-an-hour afterwards, boulder-encircled pits of a brighter green on the right, the *Themáil el-Má*, or artificial cisterns of the Arabs, announce the approach to Shaghab. The ruins are built upon a more complicated site than those of Shuwák. The Wady Shaghab spreads out in a broad bulge with a "gate" to the west: this gorge is formed by the meeting of two rocky tongue-tips both showing large works. The mass of the city lay upon the left bank; on the right side up-stream no remains are visible. The population, however, could not have amounted to one quarter that of Shuwák. Here again appear the usual succession of great squares: the largest to the east measures 500 mètres along the flanks; and there are three others, one of 400 mètres by 192. They are subtended by one of many aqueducts, whose walls, two feet thick, show no signs of brick; it is remarkable for being run underground to pierce a hillock, and in fact, the system is rather Greek or subterranean, than Roman or sub-aërial.

Still descending, we found the ancient or mediæval wells, numbering about a dozen, and in no wise differing from those of Shuwák. At the gorge, where the Wady escapes from view, we planned

buildings on the lower right bank, and on the left we found a wall about half a mile long, with the remains of a furnace and quartz scattered around it. This stone had reappeared in large quantities, the moment we crossed the divide; the pale grey of the Jebel Zigláb and its neighbours was evidently owing to its presence, and from this point it will be found extending southwards and seawards as far as El-Hejaz.

A cursory inspection of Shaghab removed some of the difficulties which had perplexed us at Shuwák and elsewhere. In the Northern Country signs of metal-working, which was mostly confined to the Wadys, have been generally obliterated; either washed away or sanded over. Here the industry revealed itself without mistake. The furnaces were few, but about each one lay heaps of *Negro* and copper-green quartz, freshly fractured; while broken handmills of basalt and lava, differing from the rub-stones and mortars of a softer substance, told their own tale.

At Shaghab, then, the metalliferous "Marú," as the Arabs call the quartz, brought from the adjacent granitic mountains was crushed; then it was transported for roasting and washing to Shuwák, where water, the prime necessary in these lands, must have been more abundant. Possibly in early days the two settlements formed one, the single Σόακα of Ptolemy; and the south end would have been the head-quarters of the wealthy. Hence the Bedawin always give it precedence—*Shaghab wa Shuwák*; moreover, we remarked a better style of building in the former, and we picked up glass as well as pottery.

After riding nine miles on our return towards the coast, we came unexpectedly upon a large and curious ruin, backed by the broad Wady Dámah gleaming white in the sun. The first feature noticed was a pair of parallel walls, or rather their foundations, thirty-five feet apart, and nearly a kilomètre in length; it looked like a vast *hangar*. To the left lie three tracings of squares: the central is a work of earth and stone, not unlike a rude battery; and, a few paces further north, a similar fort has a cistern attached to its western curtain. Heaps of rounded boulders, and the crumbling white-edged mounds which, in these regions, always denote old habitations, run down the right bank of the Wady el-Khandakí to its junction with the Wady Dámah. For want of a better name I called this old settlement *Kharábát* (the "Ruins of") *el-Khandakí*, and greatly regretted that we had not time enough to march down the whole line of the Dámah.

The Southernmost Ruins.

From Zibá we again steam southwards to El-Wijh el-Bahr ("Face of the Sea"), vulgarly called "Wedge," which lies in N. lat. 26° 14′, 86 direct miles or 107 knots by log, from El-Muwaylah. The name may be known to some of you, for here till the last two years was the main quarantine station of the pilgrims returning from Mecca. It was removed to Tor at the instance, I am told, of the English government, and the sooner it is restored to El-Wijh the better. It is my conviction that, under present circumstances, "Tor" is a standing danger, not only to Egypt, but to universal Europe.

Those who would travel inland from El-Wijh must organise a new caravan—here we are in the lands of Baliyy tribe, and Arabs do not permit transit or traffic by strange camels. There is, however, no difficulty in the journey. The civilizing influence of Egypt has made itself felt; and the old Shaykh, after a long term of imprisonment in the citadel, Cairo, has learned a remarkable courtesy to travellers.

We set out from El-Wijh on March 29, 1878, and after covering six miles we reached the inland fort. To the north-east of this work we picked up old and well-treated scoriæ, suggesting a more ancient settlement. Perhaps it was the *locale* preferred by the proprietors of the slaves who worked

the inner mines, hidden from view and from the sea breeze by the hills. Upon a reef of hard greenstone-porphyry higher up the bed, we found Bedawi *Wusúm*, or "tribal marks," and Moslem scrapings comparatively modern. About half an hour's walk leads to another "written stone." A tall, fissured rock, of the hardest porphyritic greenstone, high raised from the valley-sole, facing north-west, and reducible to two main blocks, is scattered over with these "inscriptions," that spread in all directions. Most of them are Arab *Wusúm*; others are rude drawings of men and beasts, amongst which are conspicuous the artless camel and the serpent; and there is a *duello* between two funny warriors armed with sword and shield. These efforts of art resemble, not a little, the "Totem" attempts of the "Red Indians" in North and South America. There are, however, two inscriptions evidently alphabetic, and probably Nabathæan, which are offered to the specialists in epigraphy. M. Lacaze and I copied the most striking features in our *carnets;* he taking the right or southern side and leaving the other block to me. But the results did not satisfy us; and, on April 10th, I sent him with M. Philipin to make photographs: the latter, again, are hardly as satisfactory as they might be, because the inscriptions have not been considered the central points of interest. We shall pass during our present journey many of these Oriental "John Joneses" and "Bill Browns"; they will suggest the similar features of Sinaitic Wady Mukattab, which begot those monstrous growths, "The One Primæval Language" and "The Voice of Israel from Mount Sinai."

We now approach the first of the three great mining centres, and I shall describe it with some detail. Umm el-Karáyát, the "Mother of the Villages," is denoted by an airy heap of white quartz, some 200 feet high, which, capped and strewed with snowy boulders, seems to float above its valley. Instead of being a regular round-headed cone, as is usual with such formations, the summit is distinctly crateriform. The greater part of the day was spent in examining it, and the following are the results. This *Jebel el-Marú* showed, for the first time during the whole journey, signs of systematic and civilized work. In many parts the hill has become a mere shell. We found on the near side a line of air-holes, cut in the quartz-rock, disposed north-south of one another, and preserving a rim, sunk like that of a sarcophagus, to receive a cover. Possibly it was a precaution against the plundering which ruined Brazilian Gongo Soco. The Arabs have no fear of these places, as in Wellsted's day: Messrs. Clarke and Marie explored the deepest by means of ropes, and declared that it measured sixty feet. They had to be ready with their bayonets, as sign of hyenas was common; and the beast, which slinks away in the open, is apt, when brought to bay in caverns, to rush past the intruder, carrying off a jawful of calf or thigh.

This pit had two main galleries, both choked with rubbish, leading to the east and west; and the explorers could see light glimmering through the cracks and crevices of the roof—these doubtless gave passage to the wild carnivors. In other parts the surface, especially where the earth is red, was pitted with shallow basins, and a large depression showed the sinking of the hollowed crust. *Negro* quartz was evidently abundant; but we came to the conclusion that the rock mostly worked was a rosy, mauve-coloured schist, with a deep-red fracture, and brilliant colours before they are tarnished by atmospheric oxygen. It abounds in mica, which, silvery as fish-scales, overspreads it in patches; and the precious metal had probably been sought in the veinlets between the schist and its quartz-walling. In two pieces, specks, or rather *paillettes*, of gold were found lightly and loosely adhering to the "Marú;" so lightly, indeed, that they fell off when carelessly pocketed. Veins of schist still remained, but in the galleries they had been followed out to the uttermost fibril.

Reaching the crateriform summit, we ascertained that the head of the cone had either "caved in," or had been carried off bodily to be worked. Here traces of fire, seen on the rock, suggested that it had been split by cold affusion. A view from the summit of this burrowed mound gave us at once the

measure of the past work and a most encouraging prospect for the future. We determined that the *Marwah* or "quartz-hill" of Umm el-Karáyát was the focus and centre of the southern mining region, even as the northern culminates in the Jebel el-Abyaz. Further experience rejected the theory, and showed us half a dozen foci and centres in this true quartz-region. The main hill projects a small southern spur, also bearing traces of the miner. The block of green trap to the south-west has a capping and a vein-network of quartz; here also the surface is artificially pitted. Moreover, there are detached white-yellow *pitons* to the north-east, the east, and the south; whilst a promising hillock, bearing nearly due north, adjoins the great outcrop. All have rounded conical summits and smooth sides, proving that they are yet virgin; and here perhaps, I should prefer to begin work.

At our feet, and in north lat. 26° 13′, lies the settlement, in a short gravelly reach disposed north-west to south-east; and the bed is enclosed by a rim of trap and quartz hills. The ruins lie upon a fork where two gorges, running to the east and the north-east, both fall into the broad *Wady el-Khaur*, and the latter feeds the great *Wady el-Miyáh*, "the Valley of the Waters." The remains on the upper (eastern) branch valley show where the rock was pulverized by the number of grinding implements, large and small, coarse and fine, all, save the most solid, broken to pieces by the mischievous Bedawi. Some are of the normal basalt, which may also have served for crushing grain; others are cut out of grey and ruddy granites; a few are the common *Mahrákah* or "rub-stones," and the many are handmills, of which we shall see admirable specimens further on. One was an upper stone, with holes for the handle and for feeding the mill: these articles are rare. I also secured the split half of a ball, or rather an "oblate spheroid," of serpentine with depressions, probably where held by finger and thumb; the same form is still used for grinding in the Istrian island of Veglia. I have brought here to-night one of the few rude stone implements that rewarded our search.

The north-eastern, which is the main Wady, has a sole uneven with low swells and falls. It was dry as summer dust. I had expected much in the way of botanical collection, but the plants were not in flower, and the trees, stripped of their leaves, looked "black as negroes out of holiday suits." Here lie the principal ruins, forming a rude parallelogram from north-east to south-west. The ground plan shows the usual formless heaps of stones and pebbles, with the bases of squares and oblongs, regular and irregular, large and small. There were no signs of wells or aqueducts; and the few furnaces were betrayed only by ashen heaps, thin scatters of scoriæ, and bits of flux, dark carbonate of lime. Here and there mounds of the rosy micaceous schist, still unworked, looked as if it had been washed out by the showers of ages. The general appearance is that of an *ergastulum* like Umm Ámil. Here perhaps the ore was crushed and smelted, when not rich enough to be sent down the Wady for water-working at the place where the inland fort of El-Wijh now is.

The second great mining centre lies some forty devious miles from El-Wijh. We reached it on April Fools' day, another that deserved the white stone. The site is the water-parting of the Wady Rubayyigh with the Wady Rábigh, both feeders of the Wady Sirr; this to the north, that to the south. The ruins, known as *Umm el-Haráb*, "Mother of Desolation," are the usual basement-lines; they lie in the utterly waterless basin, our camping-ground, stretching west of Marú Rubayyigh, a big white reef. This "Mother" bears nearly north of Umm el-Karáyát, in north lat. 26° 33′ 36″: her altitude was made upwards of a thousand feet above sea-level.

At Umm el-Haráb we saw for the first time an open mine, scientifically worked by the men of old. They chose a pear-shaped quartz-reef; the upper dome exposed, the converging slopes set and hidden in green trap to the east and west, and the invisible stalk extending downwards, probably deep into Earth's bowels. They began by sinking, as we see from certain rounded apertures, a line of shafts striking north-north-east (45°—50° mag.) to south-south-west across the summit, which may

measure 120 yards. The intervening sections of the roof are now broken away; and a great yawning crevasse in the hill top gives this saddleback of bare cream-coloured rock, spangled with white where recently fractured, the semblance of a "comb" or cresting reef.

We descended into our chasm, whose slope varies from a maximum of 45° to a minimum of 36° at the south. The depth apparently did not exceed thirty feet, making allowance for the filling up of centuries; but in places the hollow sound of the hammer suggested profounder pits and wells. I should greatly doubt that such shallow sinking as this could have worked out any beyond the upper part of the vein. Here it measures from six to eight feet in diameter, diminishing to four and a half and even three below. The sloping roof has been defended from collapse by large pillars of the rock, left standing as in the old Egyptian quarries; it shows the clumsy but efficient practice that preceded timbering. The material worked was evidently the quartz walling pink-coloured and silver-scaled micaceous schist; but there was also a whitish quartz, rich in geodes and veinlets of dark brown and black dust. The only inhabitants of the cave, bats and lizards (*Gongylus ocellatus*, L. etc.), did not prevent M. Lacaze making careful study of the excavation; the necessity of brown shadows, however, robs the sketch of its charm, the delicate white which still shimmers under its transparent veil of shade. Similar features exist at El-Muwaylah and El-Aujeh, in the wilderness of Kadesh: but those are *latomiæ*; these are gold mines.*

Another sign of superior labour is shown by the quartz-crushing implements. Here they are of three kinds: coarse and rough basaltic lava for the first and rudest work; red granite and syenitic granite for the next stage; and, lastly, an admirable handmill of the compactest grey granite, smooth as glass and hard as iron. Around the pin-hole are raised and depressed concentric circles intended for ornament; and the "dishing" towards the rim is regular as if turned by machinery. We have seen as yet nothing like this work; nor shall we see anything superior to it. All are nether mill-stones, so carefully smashed that one can hardly help suspecting the kind of superstitious feeling which suggested iconoclasm. The venerable Shaykh 'Afnán showed a touching ignorance concerning the labours of the ancients; and, when lectured about the *Nabat* (Nabathæans), only exclaimed, "Allah, Allah!"

After nighting at some uninteresting ruins which we named, after their Wady, *Mashghal Abá l-Gezáz*, on the second day (April 3) we reached the great station on the Nabathæan "Overland" between Leukè Kóme and Petra. It is the commercial and industrial, the agricultural and mineral centre, which the Greeks called Βαδαΐς; the Romans, Badanatha (Pliny, vi. 32); and the mediæval Arab geographers, Badá Ya'kúb. Now it is simply El-Badá: the name of the "Prophet" Jacob, supposed to have visited it from Egypt or Syria, being clean forgotten.

The better to understand the shape of the ruins we will prospect them from the *Shahíb el-Búm*, the "ash-coloured hill of the owl," one of the many rocks that stud the broad and fertile plain. It is an out-crop of grey granite, with large elements, pigeon-holed by weather, and veined by a variety of dykes. Here we find greenstone breccia'd with the blackest hornblende; there huge *filons* of hard red, heat-altered clays, faced with iron, whilst the fracture is white as trachyte; and there *filets* of quartz, traversing large curtains and sheets of light-coloured argils. This was evidently the main quarry: the sides still show signs of made zigzags; and the red blocks and boulders, all round the hill, bear the prayers and pious ejaculations of the Faithful. The characters range between square Cufic, hardly antedating four centuries, and the cursive form of our day. Some are merely scraped; others are deeply and laboriously cut in the hard material, a work more appropriate for the miner than for the passing pilgrim.

* See the illustration, "Desert of the Exodus," p. 306.

From the ruined look-out on the summit the shape of the city shows a highly irregular triangle of nine facets, forming an apex at the east end of our "Owl's Hill:" the rises and falls of the ground have evidently determined the outline. A palm-orchard, whose total circumference is 536 mètres, occupies a small portion of its south-eastern corner; and our camping-place, further east, was evidently included in the enceinte. The emplacement, extending along the eastern bank of the main watercourse, is marked by a number of mounds scattered over with broken glass and pottery of all kinds; no coins were found, but rude bits of metal, all verdigris, were picked up north of the palm-orchard.

Descending the Shahíb el-Búm, and passing a smaller black and white block appended to its south-south-western side, we now cross to the left bank of the main drain. Here lies the broken tank, the normal construction of El-Islam's flourishing days. It is a square of thirty-two mètres, whose faces and angles do not front the cardinal points. At each corner a flight of steps has been; two have almost disappeared, and the others are very shaky. The floor, originally stone-paved, is now a sheet of hard silt, growing trees and bush; dense Tanzib-clump *(Sodada decidua)*, with edible red berries, sheltering a couple of birds'-nests, suggested a comparison between the present and the past. At the east end is the *Makhzan el-Máyah* ("smaller reservoir"), an oblong of 7·80 by 6·60 mètres; the waggon-tilt roof has disappeared, and the fissures show brick within the ashlar. Along the eastern side are huge standing slabs of the coarse new sandstone with which the tank is lined; these may be remains of a conduit. Around the cistern lies a ruined graveyard, whose yawning graves supplied a couple of skulls. A broken line of masonry, probably an aqueduct, runs south-south-east (143° mag.) towards the palms; after two hundred mètres all traces of it are lost.

The mining industry could not have been a prominent feature at Badá, or we should have found, as in Shaghab and Shuwák, furnaces and scoriæ. Yet about the tank we lit upon large scatters of spalled quartz, which, according to the Baliyy, is brought from the neighbouring mountains. Some of it was rosy outside; other specimens bore stains of copper, and others showed, when broken, little pyramids of ore. Tested in England, it proved to be pure lead, a metal so rare that some metallurgists have doubted its existence: the finds have been mostly confined to auriferous lands.

Many ateliers and workshops are doubtless scattered all around the centre; but to examine them, a week, not a day, would be required. On the very eve of our departure the guides pointed northwards (350° mag.) to a "Mountain of Marú," called El-Arayfát, and declared that it contained a *Zaríbat el-Nasárá*, or "enclosure made by the Nazarenes." I offered a liberal present for specimens; all, however, swore that the distance ranged from two to three hours of dromedary, and that no mounted messenger could catch us unless we halted the next day.

On April 5 we began our return-march by bending south-westwards, making for the coast. Several unimportant sites lay on the way and in parts the whole country was barred with quartz, in gravel of the same rock, and in veins which, protruding from the dark schist, suggest that it underlies the whole surface. Nothing more remarkable than the variety of forms and tints mingling in the mighty mass—the amorphous, the crystallized, the hyaline, the burnt; here mottled and banded, there plain red and pink, green and brown, slaty and chocolate, purple, kaolin-white; and, rarest of all, honeycomb-yellow. The richest part was at the *Majrá el-Kabsh* ("Divide of the Ram"), where we alighted and secured specimens.

On April 8 we reached our southern terminus, the Wady el-Hamz: it is a feature more interesting to the Royal Geographical Society than to the Royal Institute of Architects. I will simply refer the curious to my coming book on "The Land of Midian," and proceed directly to notice its remarkable ruin. The latter is known as the *Gasr* (=Kasr). *Gurayyim Sa'íd* "Sa'íd the Brave," was an African

slave, belonging to an Arab Shaykh whose name is forgotten. One day it so happened that a *razzia* came to plunder his lord, when the black, whose strength and stature were equal to his courage and, let me add, his appetite, did more than his duty. Thus he obtained as a reward the promise of a bride, his master's daughter. But when the day of danger was past, and the slave applied for the fair guerdon, the Shaykh traitorously refused to keep his word. The Brave, finding a fit opportunity, naturally enough carried off the girl to the mountains; solemnly thrashed every pursuing party; and, having established a "reign of terror," came to the banks of the Hamz, and built the *Gusr* ("Palace") for himself and his wife. But his love for flesh-diet did not allow him to live happily ever after. As the land yielded little game, he took to sallying out every day and carrying off a camel, which in the evening he slew, and roasted, and ate, giving a small bit of it to his spouse. This extravagance ended by scandalizing the whole country-side, till at last the owner of the plundered herds, Diyáb ibn Ghánim, one of the notables celebrated in the romance called *Sírat Abú Zayd*, assembled his merry men, attacked the Gurayyim, and slew him. The site of the "Palace" is in north lat. 25° 55′ 15″. It stands upon the very edge of its Wady's left bank, a clifflet some twenty-five feet high, sloping inland with the usual dark metal disposed upon loose yellow sand. Thus it commands a glorious view of the tree-grown valley, or rather valleys, beneath it; and of the picturesque peaks of the Tihámat-Balawíyyah in the background. The distance from the sea is now a little over three miles—in ancient days it may have been much less.

The "Palace" is, I think, a Roman building; whether temple or *nymphæum*, I had no means of ascertaining. The material is the *Rughám* or alabaster supplied by the Secondary formation; and this, as we saw, readily crumbles to a white powder when burnt. The people, who in this matter may be trusted, declare that the quarries are still open at *Abú Makhárír*, under the hills embosoming *Abá'l-Marú*. We should have been less surprised had the ruin been built of marble, which might have been transported from Egypt; but this careful and classical treatment of the common country stone, only added to the marvel.

It must have been a bright and brilliant bit of colouring in its best days—hence, possibly, the local tradition that the stone sweats oil. The whole building, from the pavement to the coping notched to receive the roof-joists, is of alabaster, plain white and streaked with ruddy, mauve, and dark bands, whose mottling gives the effect of marble. Perhaps in places the gypsum has been subjected to plutonic action; and we thought that the coloured was preferred to the clear for the bases of the columns. The exposed foundations of the eastern and western walls, where the torrent has washed away the northern enceinte, show that, after the fashion of ancient Egypt, sandstone slabs have been laid under-ground, the calcaire being reserved for the hypæthral part. The admirable hydraulic cement is here and there made to take the place of broken corners, and flaws have been remedied by carefully letting in small cubes of sound stone. There are also cramp-holes for metal which, of course, has been carried off by the Bedawin, and the rusty stains suggest iron.

The building is square-shaped, as we see from the western wall, and it evidently faced eastward with 25° (mag.) of southing. This orientation, probably borrowed from the Jews, was not thoroughly adopted by Christendom till the early fifth century, when it became a *mos*. The southern wall, whose basement is perfect, shows everywhere a thickness of 0·95 centimètre, and a total length of 8 mètres 30 centimètres. At 2 mètres 87 centimètres from the south-western corner is a slightly raised surface, measuring in length 2 mètres 15 centimètres. Mr. James Fergusson supposes that this projection, which directly fronts the eastern entrance, was the base of the niche intended for the image. On each side of the latter might have been a smaller colonnette, which would account for the capital carried off by us to Egypt. Thus, adding 2 mètres 87 centimètres for the northern end swept into the valley, we have a

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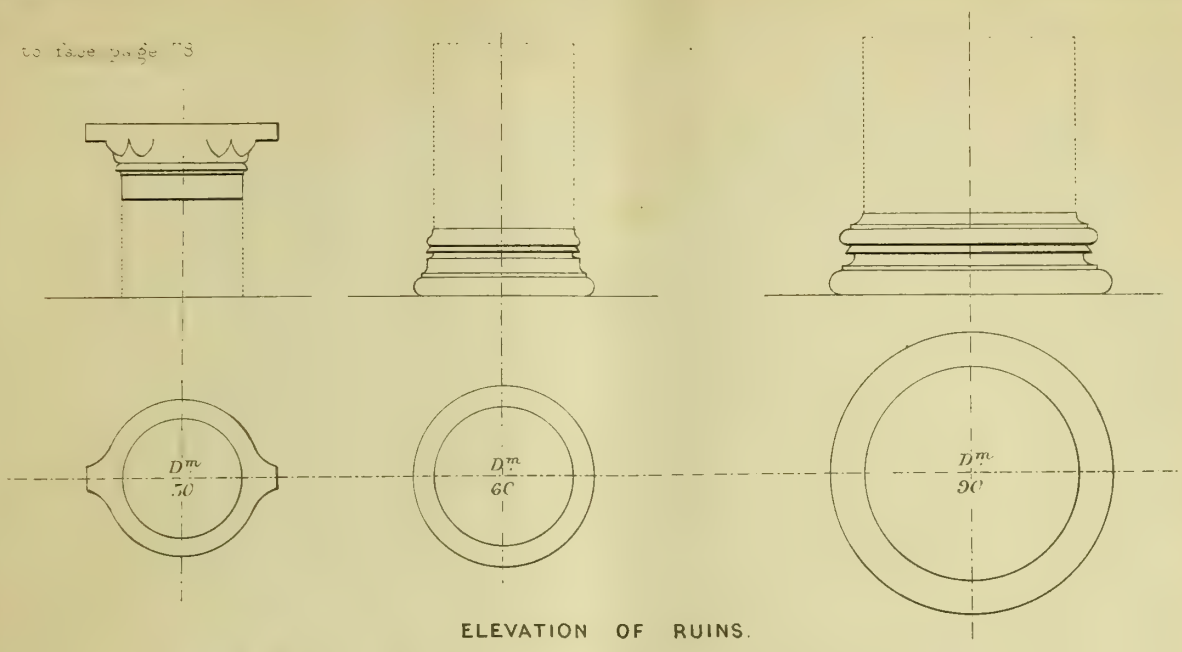
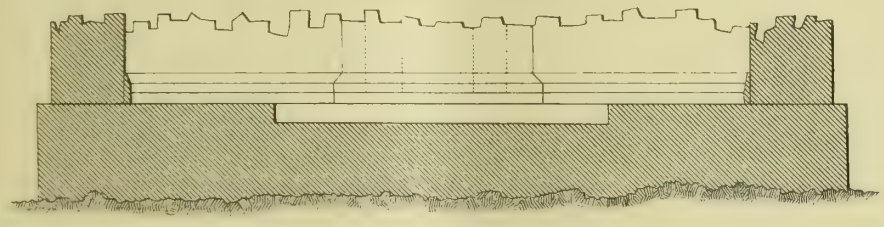
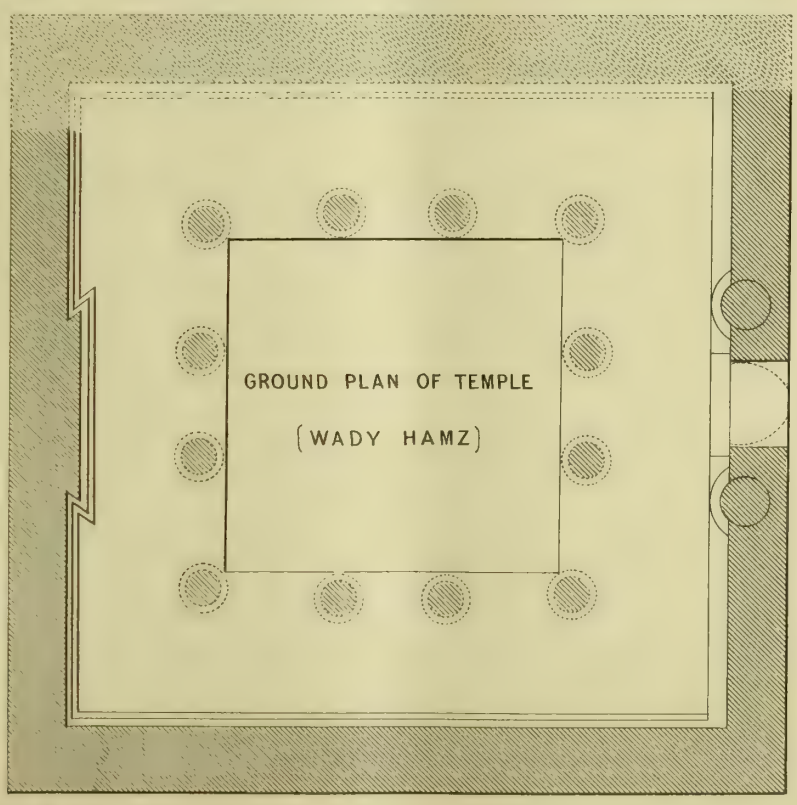


ELEVATION OF RUINS.





Richard J. Burton

Lithd. C.F.K[illegible] F.[illegible]

length of 7 mètres 89 centimètres; and the additional half thickness of the east wall would bring it to a total of 8 mètres 30 centimètres.

The shrine was not *in antis*, and the site hardly admits of a peristyle; besides which, excavations failed to find it. That it might have had a small external *atrium* is made probable by the peculiarity of the entrance. Two rounded pilasters, worked with the usual care inside, but left rough in other parts because they could not be seen, were engaged in the enceinte wall, measuring here, as elsewhere, 0·95 centimètres in thickness. Nothing remained of them but their bases, whose lower diameters were 0·95 centimètre, and the upper 0·65; the drums found elsewhere also measured 0·65. The interval between the lowest rings was 1 mètre 63 centimètres; and this would give the measure of the doorway, here probably a parallelogram. Lying on the sand-slope to the north, a single capital showed signs of double brackets, although both have been broken off; the maximum diameter across the top was 0·60 centimètre, diminishing below to 0·50 and 0·44, whilst the height was 0·40. The encircling wall was probably supported by pilasters measuring 0·62 centimètres below, 0·45 above, and 0·11 in height. They are not shown in the plan; and I leave experts to determine whether they supported the inside or the outside. Several stones, probably copings, are cut with three mortice-joints or joist-holes, each measuring 0·15 centimètres, at intervals of 0·14 to 0·15.

The tossed and tumbled interior of this *maison carrée* exactly resembles the ruins of the Synagogue of Tel Hum, and similar localities published by the Palestine Exploration Fund. The pavement-slabs, especially along the south-western side, appear in tolerable order and not much disturbed; whilst further east a long trench from north to south had been sunk by the treasure-seeker. The breadth of the free passage is 1 mètre 92 centimètres; and the disposal suggested an inner peristyle, forming an *impluvium*. Thus the cube could not have been a *heroön* or a tomb. Four bases of columns, with a number of drums, lie in the heap of ruins, and in the torrent-bed were six, of which we carried off four. They are much smaller than the pilasters of the entrance; the lower *tori* of the bases measure 0·60 centimètre in diameter, and 0·20 in height (to 0·90 and 0·25), while the drums are 0·45, instead of 0·65. It is an enormous apparatus to support what must have been a very light matter of a roof. The only specimen of a colonnette capital has an upper diameter of 0·26, a lower of 0·17, and a height of 0·16.

Although the Meccan Ka'bah is, as its name denotes, a "cube," this square alabaster box did not give the impression of being either Arab or Nabathæan. The work is far too curiously and conscientiously done; the bases and drums, as the sundries carried to Cairo prove, look rather as if turned by machinery than chiselled in the usual way. I could not but conjecture that it belongs to the days of such Roman invasions as that of Ælius Gallus. Strabo* tells us of his unfortunate friend and companion, that, on the return march, after destroying Negrán† (Pliny, vi. 32), he arrived at Egra or Hegra (El-Wijh), where he must have delayed some time before he could embark "as much of his army as could be saved," for the opposite African harbour Myus Hormus. It is within the limits of probability that this historical personage‡ might have built the Gasr, either for a shrine or for a *nymphæum*, a votive-offering to the Great Wady, which must have cheered his heart after so many days of "Desert country, with only a few watering-places." Perhaps an investigation of the

* Lib. xvi. c. iv. § 24. The MSS. differ in the name of the "village situated on the sea;" some call it Egra, others Negra, after the inland settlement, and the commentator Kramer remarks, "Mire corrupta est hæc ultima libri pars."

† North lat. 26°, which would correspond with that of the Abá'l-Marú ruins.

‡ My friend Sprenger strongly protests against Ælius Gallus, begging me to abandon him, as the Romans must long have held the whole coast to El-Haurâ, their chief settlement.

ruins at Ras Kurkumah and the remains of Madáin Sálih may throw some light upon the mystery. In our travel this bit of classical temple was unique.

Mr. Fergusson, whose authority will not readily be disputed, calls the building a small shrine, and determines that it can hardly be a tomb as it is hypæthral. The only similar building known to him is that of "Soueideh" (Suwaydah) in the Haurán (de Vogüé, "Syrie Centrale," Plate IV.) The latter, which is Roman, and belonging to the days of Herod Augustus, has a peristyle here wanting; in other respects the resemblance is striking.

I will conclude this Paper with our discovery of the mine El-Marwah, the northernmost of the gold diggings known to the mediæval Arabian geographers, and mentioned by all who have described this part of Arabia. Leaving the "Palace" we struck northwards over the salt maritime plain, and a slow ride of eight miles placed us in a safe gorge draining a dull-looking unpromising block. A short and easy ascent led to a little counter-slope, the *Majrá Mujayrah* (Mukayrah), whose whitening sides spoke of quartz. We rode down towards a granite island where the bed mouths into the broad Wady Mismáh, a feeder of the Wady 'Argah. Here, after some ten miles, the guide, Nájí, suddenly halted and, in his showman style, pointed to the left bank of the watercourse, exclaiming, "Behold Abá'l-Marú!" ("the Father of Quartz").

To the east of our camp the open Wady Mismáh showed the ruins of a large settlement which has extended right across the bed; as the guides seemed to ignore its existence, we named it the *Kharábat Abá'l-Marú*. Some of the ruins were on a large scale, and one square measured twenty yards. Here the peculiarity was the careful mining of a granitic hillock on the southern bank. The whole vein of *Negro* quartz had been cut out of three sides, leaving caves that simulated catacombs.

We have now seen, lying within short distances, three several quartz-fields, known as—*Marwah*, "the single Place or Hill of Marú" (quartz); *Marwát*, "the Places of Quartz;" and *Abá'l-Marú*, "the Father of Quartz;" not to speak of a Nakb Abú Marwah further north. Schweinfurth (the *Athenæum*, July 6, 1878) also describes a "Wadi Abu Marwa ('Quartz Valley')" south of the African Galalah block. The conclusion forced itself upon me that the name of the celebrated Arab mine *Zú'l-Marwah* or *El-Marwah*, the more ancient Μόχουρα (Mochura), which Ptolemy places in north lat. 24° 30′, applied to the whole district in South Midian, and then came to denote the chief place and centre of work. To judge by the extent of the ruins, and the signs of labour, this focus was at *Umm el-Karáyát* ("the Mother of the Villages"), which is surrounded by a multitude of miner-towns and *ateliers*. And the produce of the "diggings" would naturally gravitate to El-Badá, the great commercial station upon Nabathæan "Overland."

Thus *El-Marwah* would signify "the Place of Marú," or "Quartz-land," even as Ophir means "Red Land." A reviewer of my first book on Midian objects to the latter derivation; as "Seetzen, among others, has conclusively shown that Ophir, the true translation of which is 'riches,' is to be looked for in Southern Arabia." *Connu!* But I question the "true translation;" and, whilst owning that one of the Ophirs or "Red Lands" lay in the modern Yemen, somewhere between Sheba (Sabá) and Havilah (Khaulán), I see no reason for concluding that this was the only Ophir. Had it been a single large emporium on the Red Sea, which collected the produce of Arabia and the exports of India and of West Africa, the traditional site could hardly have escaped the notice of the inquiring Arabian geographers of our Middle Ages. The ruins of a port would have been found, and we should not be compelled theoretically to postulate its existence.

And now nothing remains but to thank you for this patient hearing; and to solicit your good wishes for the future welfare of the grand old "Land of Midian."

DISCUSSION.

THE PRESIDENT.—My friend, Capt. Burton, began by apologizing for reading in this room such a Paper as "The Remains of Buildings in Midian," because he said he thought there were few architectural remains in Midian. Those, however, who have read the author's description will have seen that he has discovered traces of buildings, which set one conjecturing in the most interesting manner as to what they represented and what they may have been in former times. Capt. Burton has given us a new pleasure in connection with what I may call an almost undiscovered land. Any general information he may give of a country which he alone has visited, must be of interest to us. The sentiments and ideas which ancient peoples and dynasties may be supposed to have entertained must, I think, interest architects. No apology was needed for reading this Paper. We were all pleased to hear it, and we have acquired information by having heard it and read it.

Captain BURTON, in answer to questions put by the President, by Professor Kerr, Professor Lewis, and others, made the following remarks:—

In reply to the question whether there are any remains existing in Midian anterior to the Romans, I may say we found one which I think may be distinctly assigned to the date of Herod Augustus; but most of the ruins are in such a state that they may be of any age. In the city of Magháir Shu'ayb, which is the Madiáma of Ptolemy, there are remains of buildings in alabaster, which has crumbled into the semblance and the consistency of salt. Most of the coins found were imitations of the Athenian tetradrachm, shewing that there were "smashers" in those days. The most remarkable specimen of the coinage was composed of a thick piece of copper with a thin plate of silver over it. On one side is the well-known owl, while the other side is almost entirely obliterated. I have shewn the coin to the Royal Asiatic Society, and the supposed date of it is 300 years B.C. It might have been transported into Midian, but there is no reason for believing it was made there. With this coin we found others of a distinctly local origin, on which there were remains of the impression of the owl, but in a perfectly barbarous form, the head of the goddess being reduced to the appearance of a single eye.

My predecessor, Dr. Beke, in his book "Sinai in Arabia," speaking of the occupation of the land of Midian by the Egyptians, gives an account of how bars of copper were brought back, of so fine a quality as to look like gold. We found in several places old mines, which had been worked by the Egyptians so thoroughly that scarcely a scrap of metal could be picked out.

Beyond what I have already said, I could form no idea of the date or the purposes of the original buildings. In the "Book of Numbers," mention is made of the castles and goodly cities of Midian, and in those days I presume the face of the country was much as it is now. They had a long line of sea coast; they carried on agriculture and commerce, and the Bedawin brought down the traffic to the coast. With regard to the question whether anything in the native traditions or fables, which may have come under my notice, enabled me to go back to the origin of the buildings which I have described as being in shapeless ruins, the fact is most of the existing tribes are comparatively modern, and of half-Egyptian origin. The people of the southern and middle portions of Midian date from the Byzantine Empire. Mention is made by all Classical geographers of the Nabatheans, with regard to whom much difference of opinion exists; it is still a question whether they were not the original inhabitants of Babylonia. No doubt they were inhabitants of Edom or Idumæa, extending as far west

as Petra, "The Rock." Most of these places have traditions attached to them. For instance, near the port of El-Muwaylah they shewed me a large slab of rock, with four marks upon it, which they hold to be hoof-prints. It was a lime-stone block, in which those appearances are not uncommon. It is related that in ancient days, when the pass was impassable on account of this rock, a man mounting a celebrated horse sprang upon the top, leaving the marks of the hoofs, and jumped down on the other side, a depth of 20 feet. There is a similar legend near the so-called Mount Sinai, and it is interesting for two reasons: firstly, it shews that in those days horses were bred in both countries; and secondly, in Ptolemy, the coast-range near the spot is mentioned as the Horse Mountain. There is no appearance in the configuration of the ridge itself to justify that appellation, so I suppose it was the tradition which suggested the name. Amongst the Arabs the mare was more thought of than the man; the modern Bedawin have forgotten the rider, but they remember the name of his horse.

I have received from my learned correspondent, Dr. Ad. Gurlt of Bonn, a book which is apparently very little known. It is the first which alludes to coal being burnt in Great Britain. It is a translation in Latin from the Greek hexameters of Dionysius Aphrus, a writer of the Augustan age, and states that gold is found in the mountains of Midian, and silver in the rivers. Other classics declare that there is a large extent of country in Western Arabia over which the precious metals were found. You will remember it has been asserted by Niebuhr and others that a mine of precious metal never had been found in Arabia, and this theory was accepted as late as the period of Sir Roderick Murchison's death.

Professor Lewis asks whether anything of a Druidical character has been found in the country? But I presume, as Mr. Fergusson is not here, the word "druidical" is used in rather a loose sense. True, I found circles in many places, and they are common in Arabia generally. One of my men promised to show me a dolmen, but he was not able to find it. I heard of only one existing in Midian; and it is said to be mounted upon three supports.

The President has remarked that it would be interesting if I were to inform you whereabouts the future treasures of this land are expected to come from. My answer is that I have no intention to monopolise them. I shall be happy to have as many shareholders as you please. There are two places where I should propose working. One is at Makná, about two thirds down the gulf of Akabah, in North Midian. There the whole mountain line, subtending the coast, is composed of quartz containing signs of gold, silver, iron and copper. The curious point is that when my late friend Dr. Beke was looking for his true "Mount Sinai," under the conviction that it was a volcano, he was much disappointed at not having found signs of plutonism. I may however state that we discovered a small volcano a little to the south of it. I would try a part of the coast with hopes of finding silver and copper; but for gold I should try South Midian. The whole strip of subtending coast is extensively covered with veins and cones of quartz. In one place a mountain has been so extensively mined that it has assumed the semblance of a crater. I should land at El-Wijh and take about a four hours' walk up the country, where it would be easy to make a tramway. You then come to a place where the old mine, still existing there, has been extensively worked. Whether the men of old were driven out by water I cannot say. Those who have the highest opinion of mining in ancient times confess that their pumps were very defective, and at the depth of 40 or 50 feet they might have been driven out by water. El-Marwah is mentioned by Mediæval geographers as the northernmost mine in which gold has been found. I presume the whole of the gold came from that chain which runs down to Aden, and what we should call in India the Western Ghâts.

GOLD IN MIDIAN.*

NIEBUHR, the traveller, who was not wholly ignorant of Arabian literature, should have been better informed when he asserted "the precious metals are not found or known to exist in Arabia, which has no mines, either of gold or silver" (Description de l'Arabie, p. 124, Amsterdam, 1774); and as Niebuhr's reputation rose high, his dictum has been universally accepted by the writers, scientific as well as popular, of the last half-century.

There could be no greater mistake. Dr. Ad. Gurlt, of Bonn, a *savant*, who is preparing for publication the "History of Mining and Smelting," remarks, in a letter addressed to me, that Midian shows (in literature) traces of the industry which, under the Phœnicians, Egyptians, Romans, Nabathæans and Arabs, has lasted nearly 2,000 years. He has kindly forwarded the following notes upon his authorities.

Moses (B.C. 1452) mentions, among the metals which were purified by fire after being plundered from the Midianites, *tin*, an ore of the greatest importance, considering the part it plays in the bronze arms, instruments, and implements of ancient nations. In Numbers xxxi. 22, we find—besides tin—gold, silver, brass (copper?), iron, and lead. All these metals were rediscovered by the second Khedivial expedition to Midian.

Ramses III. (B.C. 1000) of the twentieth dynasty, in the eleventh year of his reign, opened the great mines of copper in the land of 'Athaka ('Akabah). According to the Harris papyrus (Brit. Museum), translated by Eisenlohr, the ore was yellow as gold (pyritic copper?), while the Sinai diggings yielded only Mafkat, green copper ore (= chrysocolla). You will find the description in Dr. Beke's "Sinai in Arabia," and my coming work, "The Land of Midian (Revisited)," will copy the original hieroglyphs.

Dionysius Aphrus, a Greek geographer of Augustus's day, and interesting to us because he is the first classic that notices our coal treasures, declares of Arabia behind the Libanus and in the Nabathæan country, "Ideoque ipsa regio tantis hucusque floruisse muneribus dicitur, ut ejus montes *aurum* pariant, et flumina convehant argentum, eorumque ripæ Thymiamate et fragrantibus herbis redolent, atque qui ibi victitant maximas possident opes, neque induunt nisi paludamentis aureis, aut sericis quam mollissimis. Verum qui primum Libani montis fontem tenent, ipsi sunt qui Nabathei sunt appellati." From this it is evident that Northern Arabia was meant. (Translated by the Veronese Antonius Becharias, and printed by Henricus Paulus at Basel, A.D. 1534, p. 53.) Pliny only says of Arabia, "Litus Hammæum ubi *auri* metalla" ('Nat. Hist.,' iv. cap. 32).

Hieronymus, Bishop of Phœno, who was present at the Council of Ephesus in A.D. 449, declares that condemned Christians and other convicts were compelled to work at the copper mines of North-western Arabia. Phœno is the Phunon (or Punon) of the Book of Numbers (xxxiii. 42), a place lying four miles south of Dedan, between Zoar and Petra, and alternately belonging to Idumæa (Edom) and to Arabia Petræa. He says "Sunt autem montes *auri* fertiles in deserto procul undecim mansionibus a *Choreb* [Horeb, the so-called Mount Sinai], juxta quos Moyses scripsisse perhibetur; sed et metalla æros Phæno [he also calls copper "metallum Fenum"], quod nostro tempore corruit; montes venarum *auri* plenos olim fuisse vicinos existimant."

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* An account of Dionysius Aphrus, addressed by Capt. Burton to *The Athenæum*. By the courtesy of the Editor of that journal, the letter is permitted to appear here simultaneously.

Eusebius of Cesarea, the "Father of Ecclesiastical History" (A.D. 264-340), in his account of the persecutions of Diocletian and Maximin (A.D. 303-310), states that many Christians were condemned to the mines, "ad metalla eruenda damnati sunt"; and, "Præses provinciæ omnes ad aeris metalla, quæ sunt apud Phœnum Palestinæ damnavit" ('De Martyr Palest.,' cap. 7).

That the Arabs worked the gold mines of Egypt we know from El-Idrisi, from Abulfeda, and from the Cufic inscription of the Khalif El-Mustakfi b'Illah. A.D. 989. The old diggings have been admirably described by Linant (de Bellefonds) Pasha; and those of Coptos have lately been explored by the Egyptian staff. In my coming volumes I shall attempt to prove that those of North-western Arabia were also worked, and that tailings have been washed, perhaps, even in the present day.

Thus we have reason to believe that the mines of Midian have been known to the world for the last 2,500, and possibly for 3,000 years. You will ask, Has not the country been exhausted? and I reply not one-thousandth part of the quartz reefs has been touched. The ancients laboured with great skill and care; but, as Dr. John Percy says, water was generally an insurmountable obstacle to ancient workers proceeding *downwards* in their mines.

A correspondent who visited 'Akabah in 1864, and who wandered three months over north-western Arabia, informs me that he considers Midian a gold-field *par excellence*. The richest reefs would be in the neighbourhood of the sporadic and outlying volcanoes which, all now extinct, appear to have been connected with the Harrah, or great plutonic band subtending the coast. The northernmost of these centres he would place 9 miles south of 'Akabah along the eastern coast of the gulf, and the second 93 miles from the northern head, and some 3 miles inland from the corner of the gulf and the Red Sea. A third would be near the Jebel el-Abyaz ("White Mountain"), the great vein of quartz described in the "Gold Mines of Midian." The fourth and last great reef lies 5 miles inland and 30 miles south of the entrance of the Gulf of 'Akabah. This would place it near the central item of the three Jibál el-Kibrít ("Sulphur Hills"), whose peculiarity is that of being plutonic, whilst the two others contain the metal diffused in gypseous chalk.

It has also been brought to my attention that the celebrated Arabist, Fulgence Fresnel, detected signs of metallurgy in Midian. Wellsted in 1838 visited the site marked "Fayrabat" on the hydrographic chart, lying about five hours' walk east of Wijh el-Bahr, popularly called "Wedge," the former quarantine ground of the pilgrims returning from Meccah. He descended the shafts and explored the galleries, but he converted the quartz into limestone, and he did not perceive that he was in a gold mine. Fresnel, who followed him on April 28th, 1844, was escorted to the spot by the chief of the Baliyy clan, and at once distinguished the old workings, glass fragments and slag scattered around the ruins. The curious reader will refer, for his travels in this part of Arabia, to the "Erdkunde," Part xiii., third book, "West-Asien," second edition, 1847. Carl Ritter compiled his account from three sources: (1) *Revue des Deux Mondes*, 1839, tomes, xvi. and xvii., F. Fresnels' "L'Arabie Vue en 1837-38"; (2) *Journal Asiatique*, 4me série, séance 1840; and (3) "Lettres Manuscriptes sur l'Arabie," written after 1838 to M. J. Mohl, of the Academy, Paris. In a foot-note (p. 5) Ritter says that these letters were lent to him by M. Mohl, and during the last twenty years they have probably been published.

Fresnel calls the place Umm Hafírát or the "mother of diggings," a title well deserved, as the quartz hill has been honeycomed by the ancient miners. Shaykh Afnán, chief of the Baliyy tribe, to whom the land belongs, assured me that the ruins were known as Umm el Káráyát, or "mother of the villages," because surrounded by minor remains of such settlements, and this I personally ascertained to be the fact.

IV.—THE MODERN RESTAURANT. By Thomas Verity, *Fellow.*

Till within late years a common reproach to London was the general insufficiency of the accommodation provided for those who, either from necessity or choice, were in the habit of seeking their dinners elsewhere than in their own homes. There were indeed the clubs, the best probably in the world, but they supplied the wants of a comparatively small section of the community, and that too of a section owning, in most cases, houses and establishments of its own. London could boast, moreover, of hotels often of vast proportions, where the prices were generally on a scale of equal grandeur, and where splendour rather than comfort seemed to be the chief aim and object of the management. There were also in the city and around the law courts, taverns, popularly supposed to have been, in days gone by, the favourite haunts of great and witty men, the fame of whose memories seemed as it were to impart an additional flavour to the wines and dishes. Lower down again in the scale came the foreign establishments, which dispensed their hospitalities mostly in the neighbourhood of Leicester Square. Last of all were the little dining rooms or eating houses, where the surroundings were generally of a nature to destroy the appetite even of the least fastidious; and in fact there were few places where people could lunch or dine at a moderate cost and in a cleanly comfortable manner, with the advantage of a *menu* consisting of something beyond a chop or a steak.

As this want began to be felt it was soon found that dirt and discomfort were not absolutely indispensable to economy, and soon certain establishments, principally in connection with railway stations, at first in small refreshment rooms, but lately in handsomely appointed saloons, sprang up, such as those at the Midland and the Holborn-Viaduct Stations. For this result the public are in no small measure indebted to the proprietors of the "Criterion." The site upon which it stands was formerly occupied by two hotels, both celebrated in their time: the "White Bear" and "Webb's." The former was one of the old-fashioned galleried inns. These may be considered as examples of the old style, and the present building, being the most important of its kind yet erected, may be taken as a type of the modern house of public entertainment. I hope I shall not be considered egotistical in saying this, for after a trial of seven years, the proprietors tell me they can suggest no material alterations; the Criterion may therefore be fairly considered to meet the requirements of this particular business.

The Criterion.

In 1874 I had the pleasure of conducting the members of the Institute Conference of that year over the building, so that its arrangements will not be altogether unknown to many architects. In order to make my description clear I have had diagrams* prepared, which will explain the general character of the structure; and I may briefly say that the public portion includes dining rooms of various capacity, restaurant, grill room, buffet, smoking room, a grand hall (now used as a *table d'hôte*, but originally intended for a ball room), lavatories, retiring and cloak rooms, and, lastly, a theatre.

The General Arrangements of the Building.—The principal entrance, which is in the centre of the Piccadilly façade, is under a large recessed archway, opening into a rectangular vestibule, 30 feet by 25 feet, rising through two floors and forming the central means of

* Three of these diagrams, reduced, form the illustrations to this Paper.

communication with all the public rooms. The principal staircase, 10 feet wide, is in the centre of the end opposite the entrance and leads to the *table d'hôte* and other dining rooms on the upper floors. On the right of the vestibule is the restaurant, 70 feet by about 30 feet, and on the left is the buffet, 90 feet by 25 feet, with smoking room, 40 feet by 25 feet, at the farther end. There is also a side entrance to the buffet from Piccadilly, having on the right a small bar, where those with strong palates, or with none at all, may indulge in the fearful concoctions, with comical names, so much in vogue on the other side of the Atlantic; and on the left is a cigar shop. There is another entrance to the buffet from Jermyn Street by the secondary staircase, which runs from the bottom to the top of the house. Advantage has been taken of the difference of level in the two streets, to obtain in a half-basement a second class dining or grill room, while, to gain still greater height for this room, the floor of the smoking room has been raised 2 feet above the general level of the ground floor.

On the first floor and on the west side of the vestibule is a room, 50 feet by 25 feet, devoted to the "dîner Parisien," on the east is a room of similar dimensions for banquets, &c., and ranged along the corridor, leading to Jermyn Street, are private rooms of different sizes for parties from ten to fifty persons; these rooms are also approached from Jermyn Street by the secondary staircase. On this floor, as may be observed by a glance at the plan, the service to the west or more public rooms is by a separate passage, but for the private rooms it is by the general corridor. This at first sight may be considered an objection, but when it is remembered that the visitors would be in the rooms while the dinners were being served, it will be seen that it is not a matter of much moment.

On the second floor, at the Jermyn Street end of the building, there is a large room approached by either staircase, used principally for masonic meetings or banquets, and here the service is direct. On this floor, but at a somewhat higher level, is the grand hall, 80 feet by 50 feet and 35 feet high; this room occupies the whole length of the Piccadilly front, and is lighted by the range of great windows looking towards the street, and by a large glazed dome in the centre.

The kitchens and serveries are arranged in a central block on six successive storeys one over the other, corresponding in level with the different dining rooms, and in communication with one another by means of lifts and staircases. On the first basement is a kitchen, principally for the grill room, although much of the roasting for the restaurant and buffet on the ground floor is done here; this was at first done by a large open dangle, capable of cooking a dozen joints at one time, but it has now been replaced by a gas roasting oven, which is much more economical, takes up less space and does not throw out the same amount of heat as the open fire. Adjoining this is the vegetable kitchen and general scullery, the knife, fork, and glass cleaning rooms, for the lower part of the house—no small labour, when it is considered that the average number of dinners and luncheons is 2000, and upon several occasions the enormous number of 4,500 has been reached. On the ground floor the kitchen partakes more of the character of a serving room for the buffet and restaurant; sauces and light things such as omelettes being the only things cooked here. For the rest the joints and vegetables come from below, the *entrées* and other made dishes from the chief kitchen at the top of the house. The floor next over this (mezzanine) is the principal plate-cleaning room; here a staff of nine men is constantly employed cleaning dishes, plates, covers, &c., for the use of the entire establishment. On the first floor the service is for the east and west rooms and for the private rooms; on the second floor the service is for the masonic room and the grand hall. This may be also served directly from the principal kitchen on the next floor, for the whole series is, as I said before, in direct communication.

Dormitories for the barmaids and rooms for the managers are arranged in two storeys round the dome in the roof over the grand hall, and accommodate twenty-four persons.

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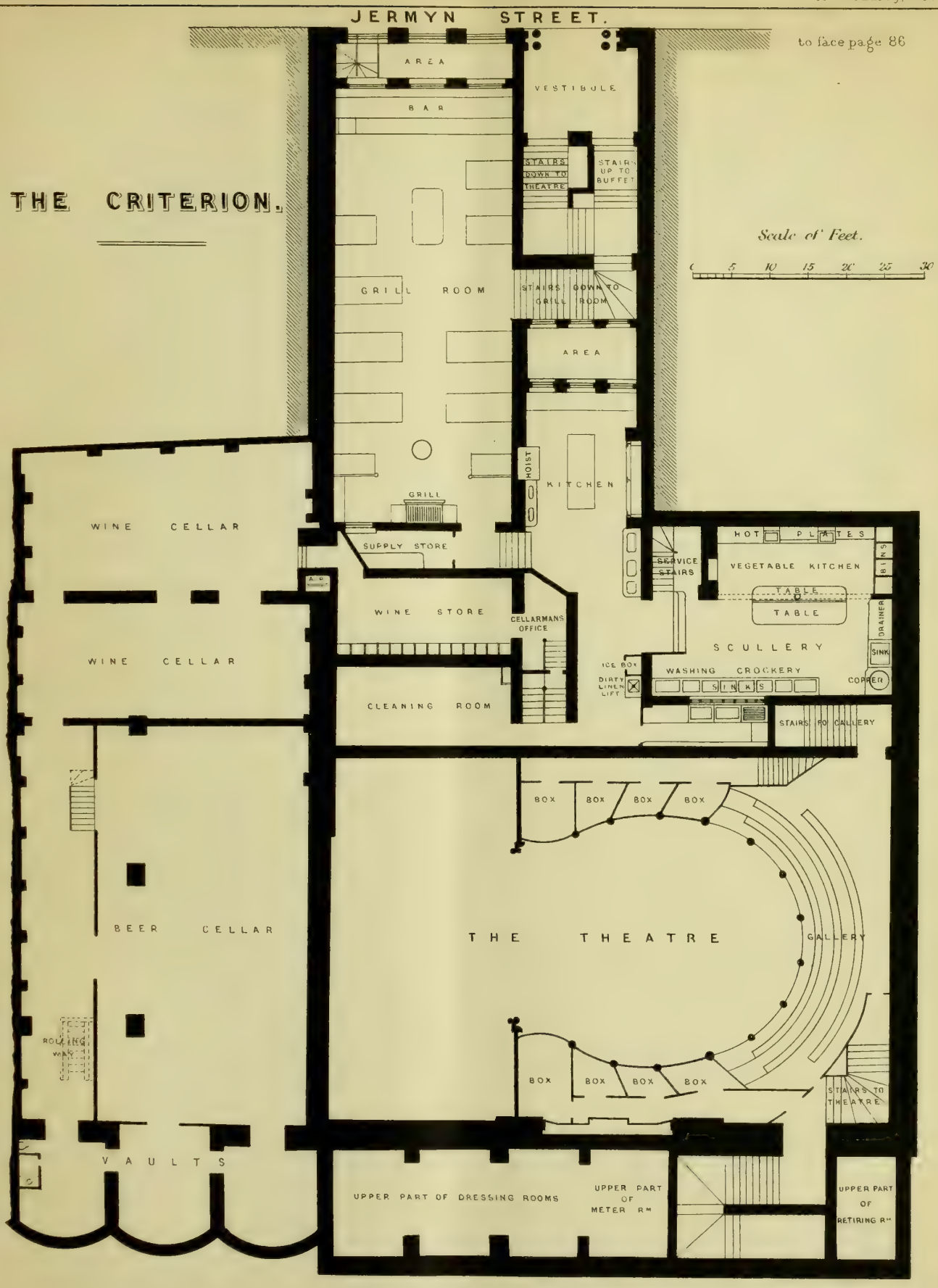

3RD BASEMENT PLAN.

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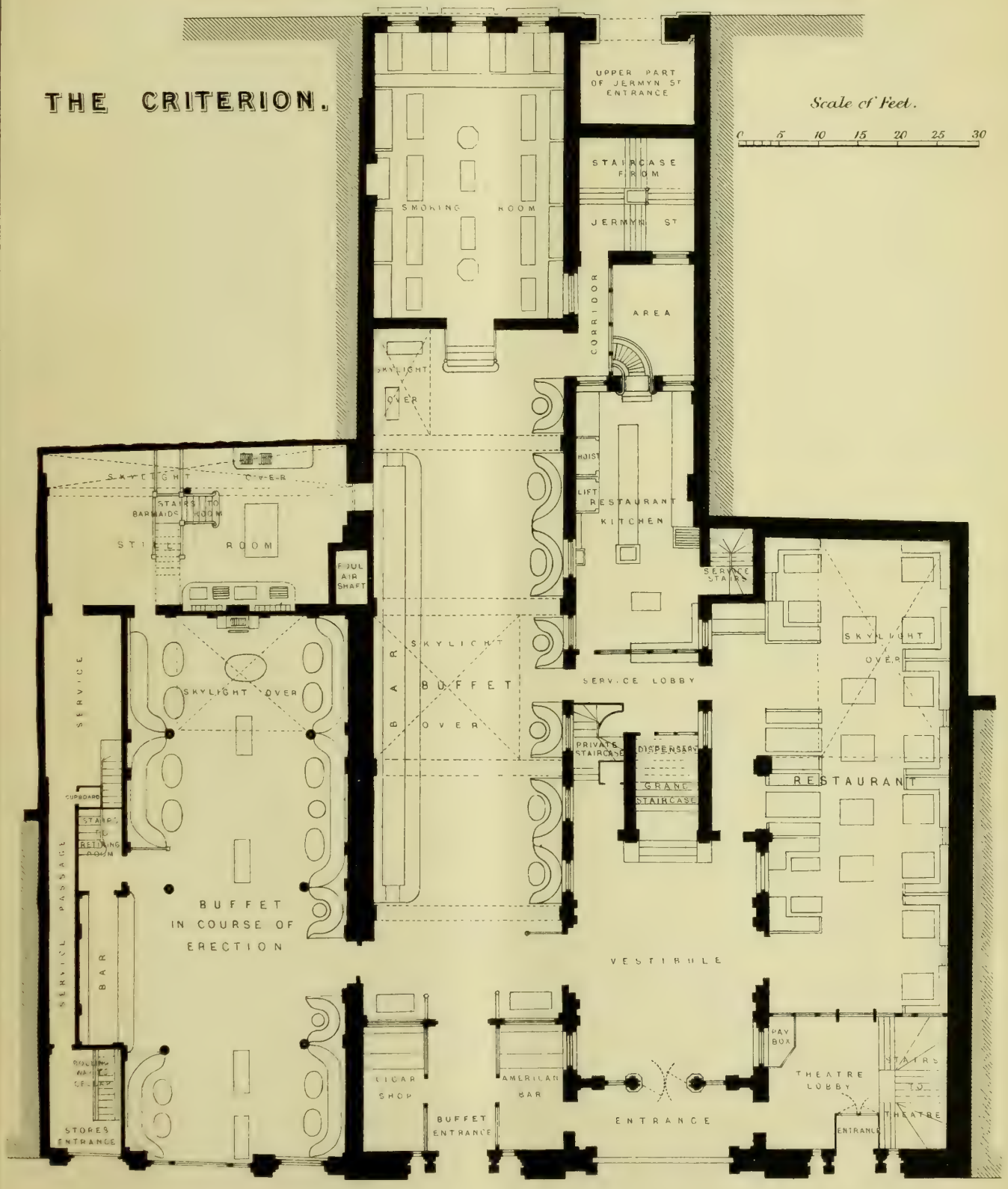
THE CRITERION.



The stores entrance is in Jermyn Street, all things being conveyed by means of a lift in the area to the lowest basement, where the receiving clerk checks them and passes them to their proper recepticles, whence they are issued as required to different parts of the house.

Up to the present time the wine and beer cellars have been temporarily housed in the adjoining premises in Piccadilly, which are now being rebuilt and added to the Criterion, the space first provided for the cellars being appropriated to other purposes.

The idea of an underground theatre was suggested by the Athénée in Paris, but whereas that is only partially sunk, this is entirely below the ground floor. It was not originally intended as a theatre, but as a small concert room, and was, indeed, constructed as a square galleried room; and it was not until the entire carcase was built that it was determined to convert it into a theatre.

Its position has been somewhat severely criticised, and all kinds of prophecies were made concerning it, some even going so far as to say that the audience would be stifled; but from careful observations of the temperature of most of the London theatres, this has been found to compare very favourably with the best. The ventilation of course is assisted by artificial means, which I will presently explain more at length. The entrance to the stalls and boxes is on the right of the central archway in Piccadilly, and that for the pit and gallery from Jermyn Street; the corridors and staircases throughout are entirely fire-proof. Some difficulty arose with the Lord Chamberlain's office at the time it was built, as to whether the theatre could be considered a separate building, for the two licenses were not allowed for the same building; but, after much controversy with the Metropolitan Board of Works, it was agreed that the floor formed a sufficiently fire-proof party division to enable the theatre and restaurant to be considered separate. The entrances were ultimately modified, so that there is no connection between the two, except through the outer lobbies.

The theatre occupies the whole length of the Piccadilly front, viz. 80 feet by a width of 50 feet, and the height from the stalls to the ceiling is 27 feet. It is divided into stalls and pit on the lower floor, balcony and boxes on the first tier, and gallery and boxes on the upper tier, and it will accommodate more than 1000 persons. The stage is 25 feet deep with a proscenium opening of 22 feet. Dressing rooms are provided on both sides and under the stage, the entrance for the players being by a separate staircase in the Jermyn Street area. Cloak and retiring rooms are provided for all classes on both sides of the house. Only very limited storage is provided for properties, &c., the stores and carpenters' shop being elsewhere; and by doing this a very serious element of danger from fire is avoided.

Lighting.—The theatre, buffet, restaurant and grand hall, are lighted at night by sunlights, having flues formed in the floors by placing rolled iron joists about 2 feet apart with slate bottoms and covers to contain the iron pipes, of which each light has three, running some distance from the burner, the outer one being carried as far as the upcast shafts in the walls.

The stage being of such a limited height, the appliances were of a very special character, particularly as regards lighting. Wing burners were almost entirely dispensed with, the batton lights being mainly depended upon to light the scene; these have iron hoods with flue pipes, coated thickly with "Smith's composition," leading to the extracting shafts going to the top of the building—the only naked lights on the stage being the float in front.

Ventilation.—The planning of the arrangements for ventilating and warming this building, with all the various conditions to be met in its several departments, involved considerable contrivance, in order to overcome the structural difficulties, and to obtain the numerous air shafts in the necessary

positions for carrying away vitiated air and to introduce fresh air. For this reason the apparatus was divided into two divisions: one being for the theatre, the large hall, restaurant, &c., and the other for the buffet, smoking room, grill room, and the dining rooms facing Jermyn Street.

For the ventilation of the theatre a fan is provided, 4 feet 6 inches diameter, worked by a direct acting steam engine. It draws its supply down a series of air shafts, formed in the main eastern wall, and forces it into an air chamber formed under the floor of the theatre. From this chamber, shafts are carried up in the walls to diffuse the fresh air at different levels around the whole space. In addition to these shafts, branch distributing channels are provided for a supply of air for the stalls and the pit. Hot-water pipes arranged in coils are fixed in the chambers, in order that the air supplied may be warmed when found necessary before its distribution. A water spray is also fixed in the main cold air supply for cleansing the air.

For the extraction of the vitiated air from the body of the theatre, a centre perforation, about 5 feet, is provided; this is in direct communication with a powerful extraction shaft, 4 feet by 3 feet, running up the entire height of the building. In order to increase the power of this shaft, the waste heat from the grill stove, and the products of combustion from the sun-burner that lights the theatre, are carried up the centre in independent wrought-iron pipes. At the gallery level and also at the back of the stage four other extraction shafts are provided. It is found, when this apparatus is in full working, that the amount of air supplied and extracted is equal to the entire renewal of the cubical contents of the theatre from five to six times *per* hour.

The ventilation arrangements for the large hall consist of a series of inlets of fresh air around three sides of the hall, in direct communication with the chamber already described. The vitiated air is removed through the sun-burner, and the perforations around it communicate with a main extractor formed over the dome. The plan adopted for the ventilation of the large hall is generally applied to all the rooms throughout the building. A second fan is provided for forcing the air to the rooms situated towards the Jermyn Street front. The steam boilers are placed in a convenient part of the basement, and are three in number: two of these are in constant work, the third is retained as a supernumerary. They supply steam for all the culinary purposes, for working the cold water and fire service; and steam for the hot-water supply, the ventilation and heating arrangements. The steam boilers are placed under supervision, and are inspected and cleaned out every two months. The hot-water service to kitchens, sculleries, lavatories, &c., is worked by a steam heater fixed in the basement, from which a 2-inch continuous flow is carried through the different departments, with suitable outlets where required. The flow terminates in two spacious circulating cisterns, and a return pipe is taken back to the heater, passing on its road all the lavatories at the Jermyn Street front. This work was executed by Mr. W. W. Phipson, C.E.

Lifts and Water Supply. The necessity of easy and rapid communication between the store rooms on the lowest basement and the kitchens at the top, and on intermediate floors, was provided for by deciding to use a direct-acting hydraulic lift; and as it was seen that a large quantity of water would be required to work it, the questions of water supply and lifting machinery were considered by Messrs. Eastons and Anderson, whom I consulted upon this part of the work, and who drew out a scheme which was executed with slight modifications.

A five-inch pipe was connected to the Grand Junction Company's main in Piccadilly, which, immediately on entering the building, branches into two pipes, each with a meter attached. One of these pipes supplies the water at high pressure and the other at low pressure,—the rate of charge for the water supplied by the former being 25 per cent. more than for that supplied by the latter. On

the roof of the building, a cast iron tank was fixed, measuring about 20 feet by 30 feet and about 4 feet deep, and from it were taken the supplies to the kitchens and other parts of the building as well as to the lift.

In the basement beneath the floor level a brick tank was made, lined with asphalte, and to it was connected the service from the low pressure pipe before mentioned, and also the over-flow from the other tank. The water discharged by the lift on its descent is conducted to the brick tank, near which is fixed a steam pump, which draws the water from the brick tank and forces it up to the cast iron one on roof. Thus no waste of water occurs, and the cost of the power for working the lift is represented by the steam used for driving the pump. The boilers which are provided for the heating and ventilating, and the cooking apparatus, also supply the steam required by the pump. It is only for short intervals and at different times in the day or night that the Water Company's pressure is sufficient to reach the upper tank, so that practically all the water used is received at low pressure and pumped up.

On the high pressure main and on the supply pipe to the lift are fixed, on each floor, fire-cocks with hose and connections; and since the upper tank almost always has some 10,000 gallons of water in it, a large supply is available in case of fire.

The hydraulic lift consists of a wrought turned ram $7\frac{1}{2}$ inches diameter, working water-tight through a gland at the top of a cylinder sunk into the ground, and has an oak cage on the top of it, with the necessary guides, valves, balance weight, &c. as usual. The length of the ram exceeds by about 3 feet the total height of the ascent cage which is 72 feet, being the height of the top kitchen floor above the lowest basement. The water pressure acting on the bottom of the ram pushes it out of the cylinder and so raises the cage. A rope, passing through the cage and extending the whole height of the lift shaft, enables it to be started or stopped by a person inside it or standing on any floor. The well for containing the cylinder of the lift was sunk to a depth, below the basement, of 80 feet, or 110 feet below Piccadilly; it was lined with 9-inch brickwork in cement and finished 3 feet diameter in the clear. The London clay was not passed through until the extreme bottom of the well was reached, when a little water made its appearance. After the completion of the well, water gradually rose until it attained a height of about 60 feet from the bottom.

All the food lifts are worked by hand by means of an endless rope; they are made with double boxes attached to one another by ropes, so that as one box ascends the other descends.

Drainage.—The basement is considerably below the main sewer in Piccadilly, and it was at one time thought that all the sewage would have to be pumped up, but fortunately it was found that in Regent Street, at the end of Jermyn Street, there existed an old sewer 40 feet below the roadway. Permission to enter this was given, and a barrel drain was driven up Jermyn Street into which all the sewage passes. It is perhaps more difficult to keep the drains free in this class of building than in any other, owing to the enormous quantities of fat and refuse of all kinds from the sculleries.

Although every provision had been made for arresting and collecting the fat by means of traps, yet it was found that a large portion passed away with the water into the down pipes, where it quickly got chilled and adhered to the pipes, causing partial stoppages; this was at last remedied, by turning the waste steam into them, which has the effect of keeping them warm, and so preventing any deposit. I must say here that the first efforts in this direction were a mistake, as I turned the steam into the cast-iron floor gutters, the result being that owing to expansion and contraction the joints soon became leaky. I have now abandoned floor gutters altogether in kitchens, and carry the waste steam to the stack pipes in the manner above mentioned.

Construction.—The whole of the ground was excavated to a depth of 30 feet below the level of Piccadilly, and in a great part the adjoining buildings were underpinned to that depth. In several places water was found, and, in order to keep it back, I adopted a system which had been successfully tried at the Royal Albert Hall for other purposes: it was, to build the back portion of the underpinning first 14 inches thick and render it with asphalte, leaving bond for the face work, the bonders being coated with and set in asphalte, as the outer work came up. The result is perfectly satisfactory, although in one place the water came through so fast from an old well on the adjoining premises, that it was with great difficulty the asphalte was made to adhere to the bricks. At first the water thus intercepted ran down the back of the wall and rose under the footings; to carry this water off I constructed surface drains with cesspools and ran it into the main drain, but as the ground consolidated this ceased in a great measure, and is now scarcely perceptible.

The concrete for foundations and the mortar is General Scott's selenitic; the floors throughout are fireproof, the basements and ground floor on Fox and Barrett's principle, and the upper floors on Dennett's system, which I consider above all the best. The reason for using Fox and Barrett's for the lower floors was to form a strong abutment for the houses and ground all round, to take the place of the shores, which it was necessary to strike, before it would have been possible to form the floors.

The large size of the rooms on the lower floors necessitated an elaborate arrangement of stanchions and girders to carry the walls above, indeed, broadly speaking, the whole of the interior was constructed in that way. All the main stanchions are protected by brickwork, and the girders either by concrete or plaster.

During the building various modifications were made from time to time, which, in some cases, caused an entire change of the system of girders; the most notable being that caused by the conversion of the theatre. The box girder carrying the west wall of the vestibule was calculated as being continuous, having bearings on four intermediate stanchions and the walls at either end, which made it a comparatively light one; when it became necessary to remove the two centre stanchions in order to form the circle, a plate girder 50 feet bearing and 3 feet 8 inches deep was inserted under the floor of the great hall, and the lower one hung up to it by slings, brought up to their work by key and cotter connections. This, considering the roof was on, and the floors were formed, was rather an anxious operation; the girder was hoisted in halves, and riveted in place—the amount of deflection in the lower girder being less than $\frac{1}{16}$ of an inch, after the removal of the hydraulic jacks which supported it during the alteration.

The Piccadilly roof consists of four Warren girders 17 feet deep, the roof shape being made by saddle frames fixed to the backs, the whole very light and giving plenty of space for the dormitories. The Jermyn Street roof is of different construction. The whole of the space being required, there could be no principals; the roof is therefore formed with an upper and a lower curb as tension and compression girders, the whole of the strains being discharged at the angles. The other parts of the building, although in some cases complicated, presented only the difficulties usually met with, and it would be uninteresting if I were to give a further description. I shall therefore proceed to notice the distinguishing feature of the decorations, which is the tile work. I have here used it very extensively as wall decoration, and whatever may be its merits or its faults, artistically, it has at least the advantage of being bright and clean, practically indestructible, and not too expensive; and what is most important, it will wash. It was the first experiment on so large a scale, and I may say I brought the idea with me from South Kensington where it was then being adopted in the refreshment rooms. Its many obvious advantages have led me to use it extensively. I may add that when I first proposed to tile the walls, it was thought that the effect would be too like a butcher's shop, but

having an opportunity of using it on a smaller scale at the Mansion House Station Restaurant, my clients were convinced of its utility, and determined to adopt it for this building.

THE COST.—Having now briefly recapitulated the chief characteristics of the building there remains yet one point of interest, viz., the cost. For the sake of comparison with other works, I have taken out the price per cubic foot, which is as follows :—The building contains 965,000 cubic feet, and the cost, including fixtures and decorations, but exclusive of kitchen fittings, gas fittings, and furniture, was £74,500., being at the rate of about 1s. 6½d. per foot. The fittings cost a sum of £21,750., or equal to about 5½d. per foot, making together 2s. per foot. This of course is only for the work which passed through my hands, and does not by any means represent the actual outlay upon the premises to fit them for carrying on the business, but that part only which would usually fall to the province of an architect.

NEW BUILDING.—The building now in course of erection on the east side of the Criterion will contain on the ground floor a buffet and smoking room 29 feet by 70 feet, with a still room at the end, to supply both the bar in the present building and also the additional one. The first floor is designed to be used either as separate dining rooms or a suite of masonic rooms. The upper floor will be in communication with the grand hall, by means of a large opening which may be closed at pleasure by shutters, so that it may be used either as an extension for the *table d'hôte* or for private banquets. The service of all these rooms will be from the present kitchens and serveries.

The Gaiety Restaurant.

As an example of a similar class of restaurant, I may allude to the Gaiety, which I have just reconstructed, and where the business consists entirely of *public* dining; there are no private rooms. On the basement is a large grill room 90 feet by 33 feet, with a double grill at one end and a dispense bar at the other. The grill is shut off from the room by a glazed screen, by which means, while all the operations of cooking the chops and steaks can be seen, the heat and smell are avoided. The room is very low, and mainly depends for light upon gas. The burners are enclosed in ceiling lanterns, having ventilating tubes constructed in the floor and entirely enclosed in the Dennett arching, so that there is no heat from this source in the room.

The buffet on the ground floor is 91 feet 6 inches by 30 feet, on the same principle as the Criterion, with a bar along one side and lounges with tables on the other. There also I have adopted painted tile work for the wall lining. The upper part of the wall is treated as a panelled frieze, with, on one side, subjects emblematical of the progress of agriculture from the first cleaning of the ground to the harvest gathering; and on the other, of the process of wine making. The ornamental portions of the ceiling are painted in kalsomine, a kind of washable distemper. On the first floor, and approached from the large vestibule in the Strand, is the *table d'hôte*, immediately over the buffet and of similar size, although of somewhat limited height on account of the old upper floors having been retained. The room will accommodate about 200 persons. On the second floor is the smoking room, about 30 feet square, where also are the gentlemen's lavatories. Cloak and retiring rooms for ladies are provided on the floor below. In this establishment the whole of the cooking is done on the top floor, which is entirely devoted to that purpose. The kitchens and sculleries have been fitted up in the same complete manner as those at the Criterion. The serving rooms for the various floors are placed one over the other; they are in communication with each other and with the kitchens at the top and the stores in the basement by means of lifts, of which there are three

varieties. The large lift for heavy weights is on the geared hydraulic principle, worked by an accumulator; the food lifts are double balanced, and worked by an endless rope by hand. The most noticeable is the one used principally for carrying the dirty plates (which have all to be sent to the top of the house). This is a continuous lift, vaguely called a Jacob's ladder: the cages are placed at intervals on two endless chains with long links passing over wheels at top and bottom, and worked by a small three-horse power engine. In reconstructing this building it became necessary to take out not only the whole of the Strand front and a part of the side front, but the ground, mezzanine and first floors were also removed in order to re-arrange the levels and gain greater height for the buffet. The new floors being of great width, viz., 33 feet, necessitated heavy girders to carry not only themselves, but the superstructure; to carry them, and at the same time to strengthen the piers, I put cast-iron stanchions secured to them by bolts to receive the girders, so that no additional weight should be put upon the old work. This involved a very extensive system of underpinning, and has been carried out in the most satisfactory manner by the contractors, to whom great credit is due for the very skilful and careful way in which the work was done.

It is almost needless to say that it is impossible to make in this instance any comparison of cost, as the nature of the work was of a very special character and involved an unusual amount of constructive difficulty, more especially as during the greater part of the time "business had to be carried on as usual during the alterations."

The Mansion House Station Restaurant.

I have before briefly alluded to the Mansion House Station Restaurant as being the first place where I tried the effect of painted tiles for wall decoration, before I adopted them for the Criterion. Feeling that the joints were objectionable, I attempted to conceal them by placing the tiles diagonally—forming a kind of lattice pattern, with foliage twined round the bars,—and placing representations of tropical and Australian birds, with full-coloured plumage, on the branches. In the panels on the lower part of the walls are kangaroos and other oddities of that land where the stones grow outside the cherries and the jackass is a bird; but although my attempt was successful so far as it went, from its very novelty, yet it was not a method which could be adopted everywhere, and perhaps some will say it is not desirable that it should. However, I came to the conclusion that it was better for the future to take the tiles as they were, and merely use them as a wall covering, ignoring the joints.

The building was not specially erected for the purposes of this particular business, and of course the best had to be made of existing arrangements. Nevertheless, by dint of much contrivance, the requirements were met, and a very spacious dining room, 100 feet by 30 feet, was obtained, with ample serving rooms, on the first floor; a ladies' dining room, a smoking room and some private rooms, retiring rooms and offices, on the second floor; and, on the upper floor, kitchens and sculleries—all, as in the other establishments, in communication by lifts. This restaurant was, I believe, the first of its kind in the City, but since its completion Mr. Francis has rebuilt the "King's Head" for a similar business, adopting the same materials for decoration with very successful results.

The main object to be considered in arranging the plan for these buildings is:—firstly, convenience of service; secondly, public comfort; and, thirdly, separation of the service from the public. Convenience of service I place first, because, on it, depends everything else. The public rooms may be as magnificent and spacious as you please, but if the service be not well arranged, the result will be dissatisfaction and disappointment.

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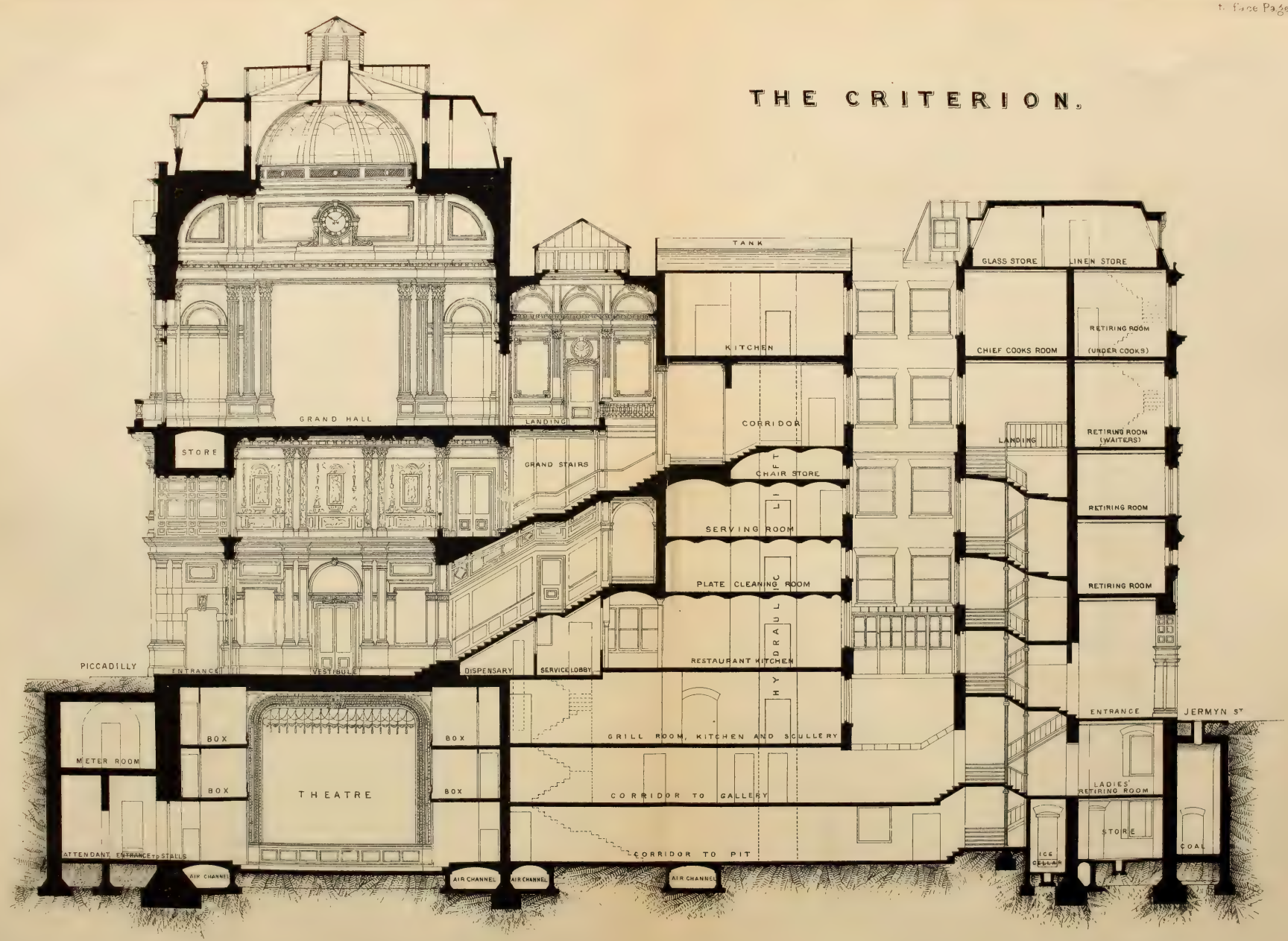
THE CRITERION.



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Lith^d by C F Kell. London E C

V.—NOTES ON ST. PAUL'S CATHEDRAL. By Francis C. Penrose, M.A., *Past Vice-President.*

The matters connected with St. Paul's Cathedral which appear to be included in the terms of the heading of this paper are: Firstly, the improvements in the Crypt, and intimately connected with these, the discovery of important records of Old St. Paul's; secondly, the proposed alterations in the Churchyard by agreement between the Dean and Chapter and the Corporation of the City of London; thirdly, the new peal of bells; and fourthly, a statement of the position in which the decoration scheme is at present.

The Crypt—Records of Old St. Paul's.

For the last seven years, or thereabouts, the Dean and Chapter have endeavoured to make the Crypt both useful for ecclesiastical purposes and more worthy as the burying place of illustrious public characters and artists than it used to be. Until lately only a small part has been shown to the public, and with the exception of the immediate centre, containing the tomb of Lord Nelson, and the contiguous chamber, in which the sarcophagus of the great Duke of Wellington is placed, it was dark and uncared for. Much of it was devoted to stowage of materials, a large portion of these being the scaffoldings which were used for the school children's festival, and the remainder serving for various necessary purposes of the cathedral. Now, with the exception of these last, the whole has been formed into what may be called a campo santo. The walls have been cleared of the soot of generations, and the floor is in the process of being laid down with mosaic tesseræ in various colours and of classical design. About 4000 square feet have already been so treated, 3000 more are decided on but not yet executed, and by degrees the rest will no doubt follow. The eastern part has been arranged for divine service, which takes place every morning and every evening at eight o'clock and on Sunday mornings the Holy Communion is there celebrated, viz., on the site of the ancient church of St. Faith. Around this part of the crypt have been arranged the remains of certain monumental effigies which were rescued from the old cathedral, and which Dugdale's accurate views taken before the fire enabled us to identify. They have each been mounted on simple kind of altar tomb with the name inscribed. They record names well known in the sixteenth century, viz., Hewett, Cockayne, Hatton, Heneage, Wolley, Baskerville, and some others.

The central nave in the crypt has now been opened for its full length of about 450 feet, and the bronze car which conveyed the body of the Duke of Wellington to the Cathedral in November, 1852, and which for a number of years occupied a chamber near the centre and terminated the part shown to the public, has been removed to the extreme west. This central portion of the nave is now divided from the side aisles, to which, with the transepts, the workshops and stores are relegated by a wrought iron railing.

It was the opening the western crypt for this purpose that led indirectly to the discovery of the remains of Old St. Paul's. One of the arches contained our huge gas meter, which entirely blocked it up. It was essential, not only for proper appearance, but for light and air, that this should be removed, and a pit was dug for it on the outside to the south of the nave. This is carried down to a depth of about ten feet from the ground line of the churchyard. The foundations of the cathedral walls go considerably deeper, so that there was no question of undermining them.

Just on the edge of this pit, and about nine feet from the surface, was found a piece of stone work evidently *in situ*, which had clearly some connection with the old fabric. The mortar was different

from that used by Sir Christopher Wren, and from its position it could have nothing to do with his work. There was embedded in it the frustum of a column, apparently Norman, from which it seemed that this piece of foundation belonged to some of the fourteenth century work, and that the Norman fragment was old material derived from the original choir, or perhaps from St. Faith's church, demolished in 1256. This find then seemed in all probability a relic of old St. Paul's. I fortunately had in my office a copy of the plan contained amongst the Wren collection in All Souls' Library, Oxford, which represents the new cathedral placed upon the old,* and from this plan I assumed I had hit upon the foundation of one of the piers of the passage leading from the cloister into the chapter-house. I reported my discovery to the Dean and Chapter, and obtained from them permission to make a few more trials for other parts of the old structure.

Guided by the plan, I sunk a pit more to the westwards, to try for one of the buttresses of the chapter-house, but with no result. The earth even showed no signs of having been disturbed. I then tried backwards towards the south-east, thinking I might at least get hold of another part of the cloister. The plan again proved faithless; but a little more burrowing towards the east revealed a fragment of what I thought might be a buttress of the main transept wall,—that is the western wall of the south transept. This was about the same depth below the surface as the first discovered fragment; and this, whilst it gave clear evidence that something was amiss with the plan, pointed out a more likely place for the next trial, and the result at once appeared to prove the correctness of the hypothesis, for the next morning the clerk of works came to tell me with much satisfaction that part of the cloister wall with its buttresses had been found, and the S.E. internal angle soon followed. These foundations, too, were at no great depth from the surface, and their excavation was no great difficulty. Two of the great buttresses of the chapter-house rewarded our further investigation, but these were all, for the other buttresses of the chapter-house had been entirely rooted up, partly for the requirements of the new structure and partly for the drains. We also found the external S.E. angle of the cloister and part of the street wall, and the internal S.W. angle and some traces of the external angle corresponding to it. The pavement in several places exists, composed of squares and lozenges of purbeck marble, and is about 14 feet below the pavement of the present cathedral, but very nearly on a level with the street to the south.

These remains belong to the lower storey of what Sir Christopher Wren has described as "a chapter-house of a more elegant Gothick manner with a cloyster of two stories high." The historians of the cathedral inform us that the chapter-house was began to be built in 1332: but when we study the detail of the mouldings, which are very small and refined, it is impossible to attribute so early a date. Nevertheless, both Hollar's view and some remains of tracery which were dug up during the excavations point to a general design which would almost fit in with the period assigned. The probability is that the work is actually of the end of the fourteenth century, but that an earlier design had, with some modifications, been carried out.

The vaulting of the chapter-house, although the building was octagonal, was arranged (in the lower storey at any rate) so as to rest upon four central columns. This is shown in all the plans; and the base of the middle vaulting shaft is curiously divergent from the others which follow the octagonal arrangement for this purpose: namely that of reaching one of the four central piers. All the chapter-house shafts and bases are of Caen stone, but those of the cloister are of Purbeck marble. All are extremely well cut and elegantly profiled.

Fearing the effects of frost upon this newly opened masonry, I had them twice coated with bees-wax dissolved in spirits of turpentine, and thus far they seem to have well resisted the action

* A reduced copy of this plan is published in Mr. Longman's work, "The Three Cathedrals."

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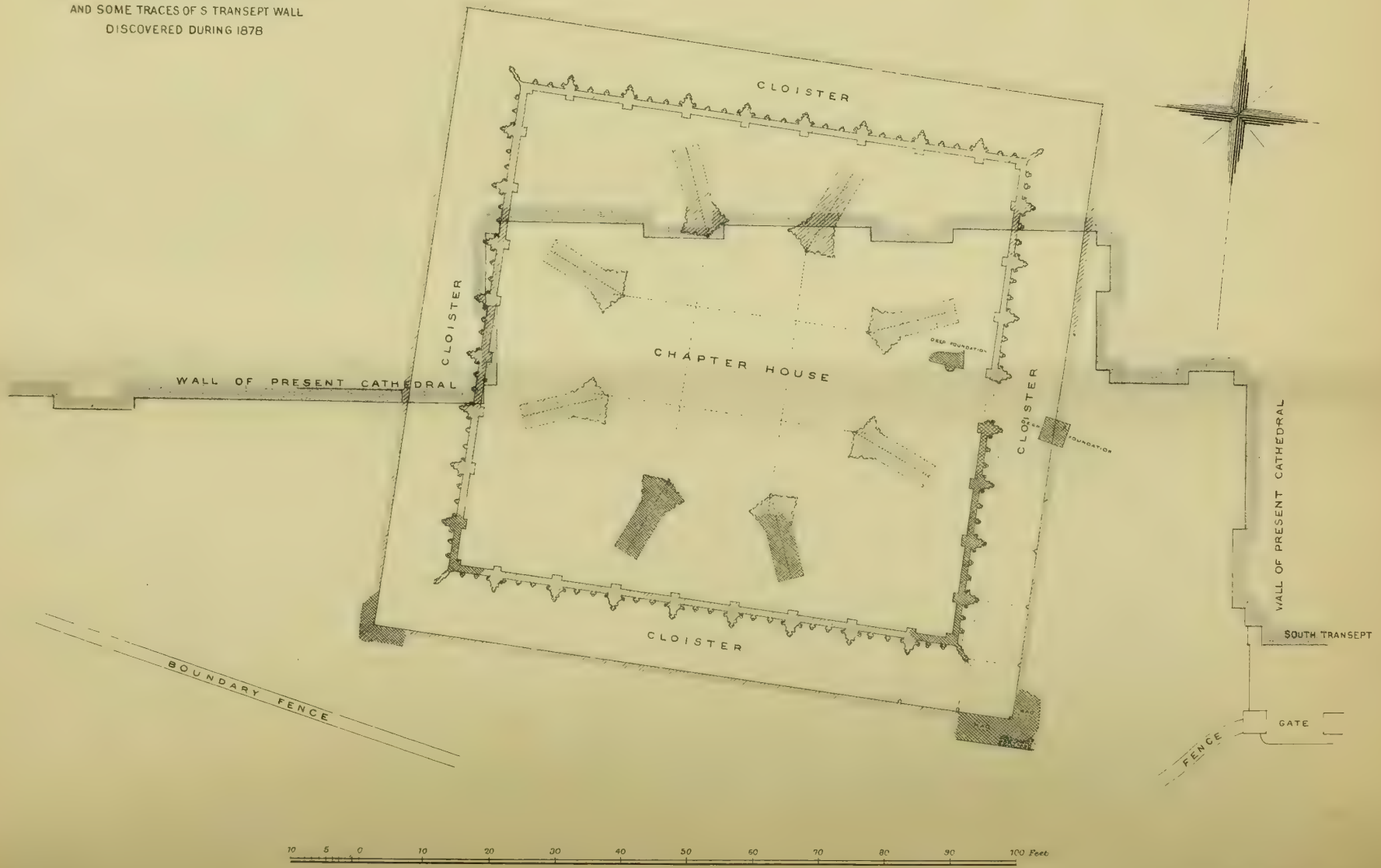
OLD SAINT PAUL'S

THE REMAINS OF THE

CLOISTERS & CHAPTER HOUSE

AND SOME TRACES OF S TRANSEPT WALL
DISCOVERED DURING 1878



Lith^d by C F Kell. London E C

of the weather, whilst some stones of the same material which, not being *in situ*, were left to themselves, have been much affected by it.

A plan is submitted, showing the whole of our discoveries, to a scale of three inches to ten feet,* and all the mouldings are given more at large; the bases full size, the others half size. These discoveries show the angles of the cloister, and enable us to recover with great precision the centre of the chapter-house. When these are compared with the Oxford plan, there is found to be an error both southwards and eastwards, amounting to about ten feet in each direction. In other respects the cloister is accurately blocked out, and the length and breadth are in very close agreement with the dimensions. It is a matter of very great interest to ascertain, if possible, whether the plan must be given up as hopelessly inaccurate to at least the above extent, or whether there may not be what may be called an occult reason for the particular error I have noticed, which does not vitiate the plan altogether. I have prepared a plan of the existing cathedral from measurements to the same scale as the Oxford plan, and find that the two agree very well indeed. This is, therefore, presumably in its favour. Then we have to consider what was the object of this particular plan; not the detail of the architecture, which is merely sketched on the plan, but the exhibition of the divergence of the axial lines of the two buildings.

There are great peculiarities about this plan, which unless proved to be carelessness must have an important meaning. The line which is shown for the west front is very considerably out of square with that which is given as the axis of the cathedral; neither is the axis of the transept square with it. The latter is shown as almost parallel to the west front. The east end again is an oblique line. Let us compare this plan with other plans of old St. Paul's. I do not undervalue Mr. Ferrey's careful and elaborate plan,† but am considering original documents only. The plan is very nearly to the same scale as that given by Dugdale, engraved by Hollar, but there are some differences which shew it to be an independent document. There is also among the All Souls Wren Collection drawings, a larger plan on vellum, but it is not itself original, and the following account of its authorship has been given me:—"The plan is on vellum, and Elmes in his Catalogue of Wren's drawings says of it, 'Mr. Gutch tells me that Mr. Buckler copied it for Sir H. Englefield.'" Nevertheless, it seems from the above to have been copied from something else, perhaps from an old plan which was falling to pieces, and it certainly represents the Cloister and Chapter House with great accuracy. I will call this the Oxford Plan No. 2.

There is also a small-scale plan, engraved by Loggan, and published by Thomas Bowles, St. Paul's Churchyard, about 1714, but I think the engraving itself must be considerably older. Thus we have at any rate four plans to refer to, and there is the tradition preserved by Stow that the old Cathedral was 690 feet long. This statement Mr. Ferrey has discussed at length in his contribution to Mr. Longman's work, "The Three Cathedrals," and I think has very justly come to the conclusion that the first figure is in error, and that the proper statement should have been DXC. instead of DCXC. This extreme length is at variance with all the plans, although some approach to it is made in the Oxford Plan No. 2, which appears to give the length of 660 feet. The discovery of the Cloister enables the scales put upon these drawings to be tested, and they do not any of them bear the test very well. The Oxford Plan No. 1, however,—that which shews the two Cathedrals,—when a proper scale is made for it, from the full length of 507 feet, that is from the extremity of the

* See the plan, reduced, in plate 1.

† Mr. Ferrey's drawings consist of a plan, elevations and sections of the old Cathedral as restored, drawn to a large scale, for which the Silver Medal of the Institute was adjudged. These drawings have been presented by Mr. Ferrey to the Dean and Chapter of St. Paul's.

present apse to the Western Towers inclusive, shews exactly the proper measure for the South wall of the Cloister, which is a strong presumption in favour of the general correctness of the drawing, excepting as to the scale, which may have been added by a different hand. The simplest test which can be applied to the plans in comparing them *inter se*, is that of the proportion between the Nave and the Choir taken from the centre of the Tower. These are the results :—

	Nave.	Choir.
Hollar's Plan	1000	904
Oxford Plan No. 1	—	880
„ „ No. 2	—	998
The Small Plan	1000	962

There are thus two pairs which hold together pretty fairly, Hollar's and the Oxford No. 1 in giving a mean proportion of 1000 to less than 900, and two others which hold well together in giving a much larger proportion.

There are a considerable number of perspective views extant, and if we examine these together (however divergent they may be among themselves) the mean result may be used to check the plans. Dugdale gives two. The same engraved sheet which contains Loggan's plan gives three. These results are here tabulated :—

	Nave.	Choir.
Dugdale—North	1000	795
Dugdale—South	1000	785
Loggan—North	1000	752
Loggan—South	1000	917
And to a smaller scale on the same sheet—South	1000	890
Mean . .	1000	828

My object in this investigation is to establish the probability of the Oxford Plan No. 1 being trustworthy, and the evidence of the perspective views is, as far as it goes, in favour of this probability, in reducing the ratio of the length of the Nave to that of the Choir. Another argument in its favour is drawn from the fact that the extent of our Churchyard to the East is exactly the difference of length shewn between the old and new Cathedral on the plan. And in the account of Sir Christopher Wren's works in the "Parentalia," it is stated that the Commissioners for rebuilding the City had settled and had obtained Parliamentary sanction for the width of all the streets before anything had been fully determined about the design for the new fabrick. It seems therefore extremely probable that the street defines most accurately the extent of the old Cathedral, and that this is again in favour of the Oxford Plan No. 1.

The *primâ facie* points which make against it are—firstly, that it does not fit our new discoveries; secondly, that the internal detail is drawn in an obviously careless manner, the pillars of the central tower alone seeming to have been properly laid down, and the rest merely sketched in hap-hazard; and, lastly, the curiously oblique lines of the fronts and ends, &c., which I have already noticed.*

I think, however, that I shall be able to shew that the last-mentioned *primâ facie* doubtful point is really an evidence of the accuracy of the plan. The second is nothing more than inattention to a detail which had nothing to do with the gist of the drawing, and that the first-named misfit has arisen from the fact that the draughtsman was put out by an irregularity of which he had no previous

* An oblique line to the West front is also shewn in Loggan's plan.

experience, namely, a deflection of the axis of the Choir from that of the Nave. This appears to be the solution of the whole difficulty, and when the drawing is corrected for this peculiar arrangement everything fits in its place, and the oblique lines are all of them reduced to their proper square directions. And now the plan becomes intelligible, but I have additional evidence, and will here quote a passage from the "Parentalia" which is very much to the point:—

"The reasons for changing the site of the Church and taking up all the old foundations are chiefly these:—Firstly, the Act of Parliament for rebuilding the City had enacted that all the high streets (of which that which lead round the South side of St. Paul's was one) should be 40 feet broad, but the old foundations streightened the street towards the East end to under 30 feet.

"Secondly, the Churchyard on the North side was wide, and afforded room that way to give the new Fabrick a more free and graceful aspect.

"Thirdly, to have built on the old foundations must have confined the Surveyor too much to the old plan and form: the ruinous walls in no part were to be trusted again, nor would the old and new work unite or stand together without cracks.

"It being found expedient therefore to change the foundations, he took the advantage of more room Northward, and laid the middle line of the new work more declining to the North-East than it was before, which was not due East and West, neither did the old front of the Cathedral lie direct from *Ludgate*, as it does not at present, which was not practicable without purchasing and taking down a great number of houses and the aid of Parliament. This, tho' much wished for, he was not able to effect. The Commissioners for rebuilding the City had in the first place marked and staked out all the streets, and the Parliament confirmed their report, before anything had been fully determined about the design for the new Fabrick. The proprietors of the ground, with much eagerness and haste, had began to build; accordingly an incredible progress had been made in a very short time; many fair and large houses erected, and every foot of ground in that trading and populous part of the town was highly estimated."

It is here then stated, upon the authority of Sir Christopher Wren, that the axis of the new Cathedral was set more declining to the North-East than it was before. But how if the Cloister wall shews that the Nave declined to the *South*-East instead of the North-East? Sir Christopher Wren was not a man to be mistaken in a matter of East and West, but he may have put down to irregularity, which he more than once mentions in connection with the Choir, the deflection of its axis, and which produced the North-Easterly tendency of the whole Cathedral. These bearings are as follows:—

The New Cathedral to the *North*-East	6°. 28′
The Nave as given by the Cloister wall and Chapter House to the *South-East*	0°. 59′
But the general axis of the Cathedral to the North-East	3°. 15′

That is on the assumption that the Oxford plan No. 1 correctly shows the correlation of the old and new fabric at the east end. That this was correctly marked on the plan, both at the east and west, I have scarcely any doubt; but as the whole of the foundations of the choir must, I fear, have been removed, our only chance of proof from the spade will be in the possible discovery of the foundations of St. Paul's cross, of which I by no means despair. But there is nothing unreasonable in the idea of a deflection of the axis. In the case we are contemplating, it must have been certainly large—not much less than 4°. There is, however, in a fine abbey church—Whitby—an instance very much more considerable. To tabulate such cases as are known to me:—

Whitby	6° 20′
Old St. Paul's, *hypothesis* . . .	3° 55′
Litchfield	1° 45′

St. Mary's Oxford also has it to a very considerable degree; the amount is 3° 20′. The above all incline to the north, which is the general direction; but there are instances of deflection to the south. Other cathedrals may be cited for a smaller amount from my own observation: I may name York, Norwich, Peterborough, and Lincoln, as designed by Bp. Remigius, but afterwards the axis was straightened by Grostete; also to a small but very perceptible extent St. Peters at Rome.

If we assume the nave to have been square with the west front, and with its westernmost point correctly shown on the plan, and then set it out on this hypothesis, not only do the cloister and chapter house agree very nearly indeed with their real places, but the south wall of St. Gregory's church falls centrally upon a piece of foundation, which was discovered in the alterations made about six years ago at the west end, namely a strong Portland stone foundation, which probably belonged to some classical addition by Inigo Jones, where a central entrance door is shown on some of the drawings. The strongest argument however is to come. On the hypothesis that the axis of the nave must so be corrected, I ventured a few days ago to ask for and obtained leave to dig in the north churchyard for the traces of the north transept wall, and found them in the very first pit, within two feet of the centre of the hole. The whole of the work west of the tower is thus shown to be in accordance with the plan after correction in the manner above explained, and the axis of the transept agrees in direction with the plan, and all this comes by moving it on the western extremity of the axis as a pivot. I think then we must also conclude that the eastern extremity had the relation to the present cathedral that the plan shows, and this implies the deflection of the axis of the choir. The deflection we are supposing could not have been continued without much inequality in some of the choir arches; some must have been spread out and others contracted. On this point we have Sir Christopher Wren's evidence, taken from the "Parentalia," p. 274, "Lastly the intercolumniations or spaces between the Pillars of the Quire next adjoining to the Tower are very unequal." This is exactly what must have occurred with a deflected axis and the transept square with the nave.

The Oxford plan, No. 1, shows the axial lines as coincident at the extremity of the old choir. This would seem a very probable arrangement. But in stating this we must not overlook the words of the Parentalia, quoted above, that Sir Christopher Wren took advantage of more room northward, &c. The Oxford plan, however, as it stands, shows a larger area of the new cathedral to the south of the old; whereas the amended plan gives the preponderance, although only a small one, to the north side. I claim, however, that the first purpose and end of that plan is that it was intended to show the axial deviations of the two cathedrals, and that it placed them at the east and west extremities correctly, whatever it did elsewhere; and if so, there must have been the deflection of axis which I have spoken of. It is to be observed further that the plan as drawn shows the eastern wall very oblique to the axis of the cathedral, and the correction of the axis in the way proposed brings it very nearly square. Thus the only way to reconcile this plan with the new discoveries, if we retain the eastern points of coincidence, is by a deflection; and if there was no deflection, a plan which after a simple readjustment has proved itself accurate at the north transept must be entirely discredited as to its representation of the east end.

The arguments against the deflection are the silence of Sir Christopher Wren on the point, and that a straight axis is shown on this and in the other two plans, viz. Hollar's and Loggan's (for the Oxford plan, No. 2, lacks authenticity), and the words of the Parentalia that "The Surveyor took advantage of more room northward," may be quoted in this sense; but this last point is neutralized by the consideration that the same passage speaks of the axis of old St. Paul's as declining north of east, which would not have been true of an undeflected axis, for it has been demonstrated that the

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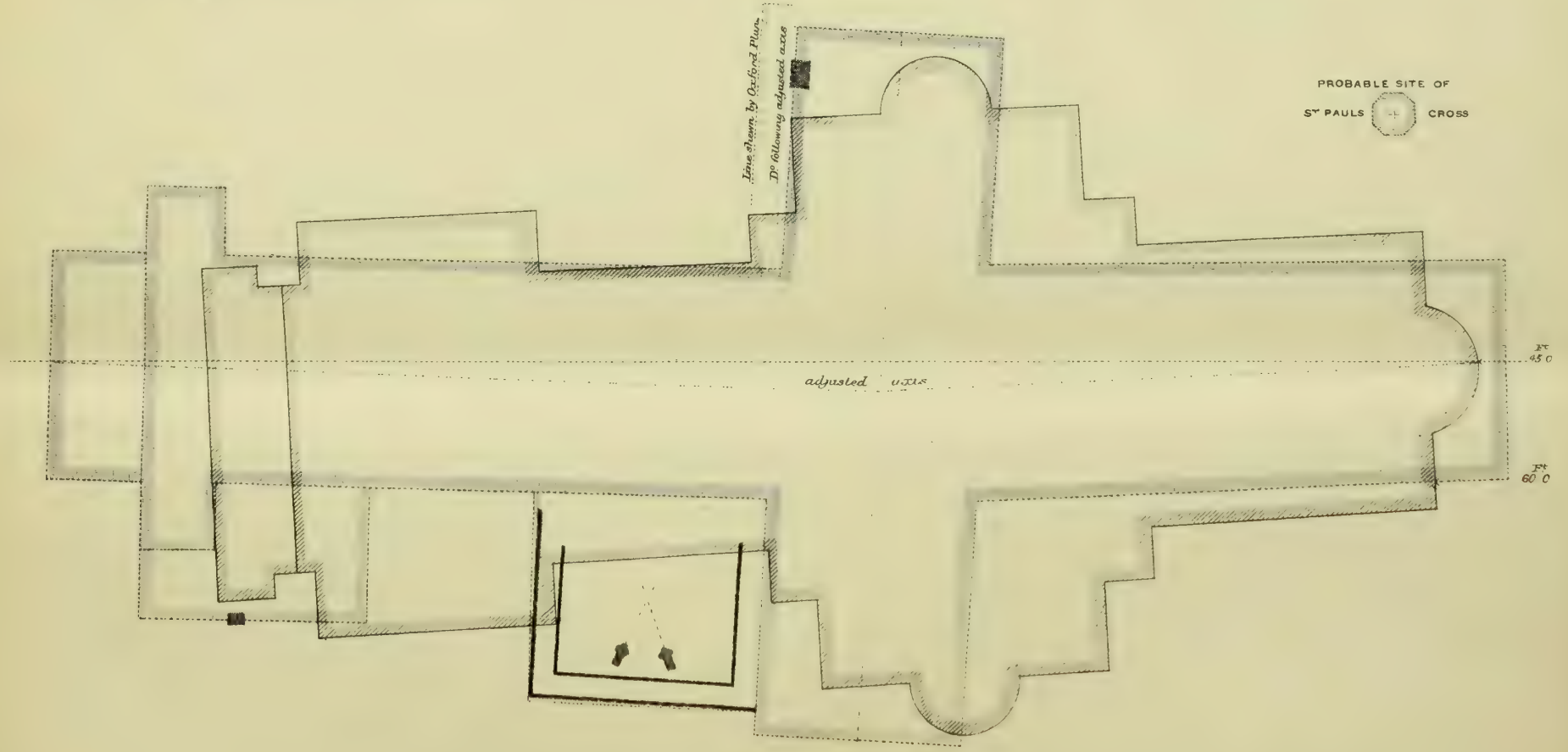
St. PAUL'S CATHEDRAL

FROM A DRAWING AT ALL SOULS COLL. OXFORD,
BUT SHEWING AXIS OF CATHEDRAL ADJUSTED TO
SUIT THE RECENT DISCOVERIES.



NOTE. *The recent discoveries are indicated thus* ▒

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axis of the nave did not decline to the north east at all. Besides the orientation would then have been so nearly true that he would scarcely have said it was not so without some qualification. The confirmation I hope for may perhaps come from the foundations of St. Paul's cross. This interesting structure is shown on the Oxford plan, No. 2, and the place is confirmed by several old perspective views.

It is true that the plan just referred to gives an impossible extension to the choir, but the compiler was probably influenced by Stow's figure of 690. I think his place for St. Paul's Cross about opposite the buttress dividing the second and third bay of the choir, and its distance from the cathedral itself may be allowed to have much weight, especially as he has rendered the due proportions of the chapter-house to the cloister, which neither Hollar's nor the Oxford plan, No. 1, has properly represented; and gives the correct number of bays of the cloister which those do not.

The Proposed Alterations in the Churchyard.

There is an agreement between the City of London and the Dean and Chapter of St. Paul's, in concert with the Rectors and Churchwardens of St. Gregory and St. Faith, who have certain rights concurrently with the Dean and Chapter, for improvements in the churchyard, which I trust will be favourable for the examination of the part of the yard in question, as there appear to be no graves in the immediate neighbourhood of the most probable site. In carrying out these arrangements care will be taken by the express stipulation of the Dean and Chapter, and the no less cordial desire of the city architect, to preserve the old remains which have been discovered, and to allow them to be well seen.

The New Peal of Bells.

I have on my programme a few remarks to make on the bells which have lately been added to the cathedral and hung in the north tower. This tower, although in the general view of the cathedral it does not seem a large object, now contains all on one level twelve bells which Sir Edmund Beckett considers the heaviest peal that can be rung. The tenor is 62 cwt., and the total peal weighs about 272 cwt. The original floor, which seems to have been calculated for a much lighter peal, had in consequence to be strengthened. This has been done by powerful struts, two from each face of the tower, meeting in a quadrate collar arrangement, which strengthens the whole floor. The timbers are large, generally 18 inches deep, and some as much as 16 inches broad, either oak or of teak. The frame also is very solid. The effect produced by the swinging of the enormous mass of metal composing the peal is almost *nil*. I have, whilst the ringing was going on placed my hand between the timbers of the frame and the stone work of the tower, and have felt nothing more than the slightest possible palpitating movement, very similar to that of my pulse and scarcely more perceptible. The bells were cast and hung by Messrs. Taylor, of Loughborough, and are the gift of the Corporation and some of the leading Companies of the City of London.

The Decoration Scheme.

The position of the scheme for the embellishment of St. Paul's is this. A sub-committee has recommended the adoption of a design left by Mr. Alfred Stevens for the pictorial treatment of the dome in mosaic. The President of the Royal Academy and Mr. Poynter have agreed to assist the Dean and Chapter and the committee in carrying out this design, with such modifications as the proper selection of the subjects entails, and they are now considering the proper means of carrying out the proposal, which is to begin by a full-sized cartoon placed up in the dome itself, so that the scale of the work may be thoroughly settled and adjusted to its proper situation. This work, both preliminary and final, will necessarily take a considerable time.

The Dome.

In connection with the embellishment of the Dome, it may interest the Members to consider a very curious evidence of thought on the skilful and scientific designer of the Cathedral, which I found when making the careful measurements of the configuration of the cupola which was requisite for this undertaking. These measurements for the section were taken with the help of the theodolite, and in several ways, so as to check, or I may rather say confirm, one another, so that I have no doubt of their accuracy within some fraction of an inch. Having got the measurements I was soon able to make out a system of three centres with radii about 67 feet, 46 feet, and 60½ feet, which afforded an exceedingly close approximation to the figure. But I spent a great deal of time in endeavouring to make out a law of design combining these centres and radii. At last it struck me that the arc of a parabola which should be a tangent to the sloping side of the drum at the springing, and of which the central line or axis of symmetry was inclined to the horizon at an angle of 51°. 30′, might afford a probable solution. These data, combined with the springing and culminating points of the Dome, enabled the elements, as they are called, of the curve to be calculated, and when done, although it differed a little from the contour of the dome as executed, it explained the theory of the centres and radii which I had been seeking—absolutely. The correspondences are here exhibited :—

After adjusting the measured and the calculated dimensions at the bottom and the top, that is at the springing point and the circular eye of the dome, we have for the equivalent heights.	Feet.		Feet.
	40·30,	a difference in horizontal measure of	·03
,, ,, ,, ,,	37·65,	,, ,,	·06
,, ,, ,, ,,	13·40,	,, ,,	·00
And at the height of about 55·00 feet, where the horizontal measures have been equated, a difference in vertical measure of			·06

The centres and radii are thus determined: namely, we first suppose the theoretical parabolic arc to be drawn and the angle formed between its inclined axis and the base of the cupola be bisected, viz., by the angle of 25° 45′, the point where this line cuts the curve is taken as a given point in the section, and it is found that a radius of 66·60 feet with its centre on the springing line will join this point and the springing point of the cupola. Draw this arc and continue it upwards about half as far as it has been used below the point. If this centre be now joined to the point where the parabolic axis meets the vertical central axis of the dome 12·8 feet below the base line, and the latter be taken for the centre of the second sweep, the junction of this with the first will be on this line produced. The radius will be 46·10 feet, and the arc will extend about 13° on each side of the parabolic axis, and then it will merge into a third sweep of which the centre is again on the springing line, and which will complete the section. The radius 66·60 feet is also the radius of curvature, as it is called, due to the parabola at the middle of the arc formed by its aid, and the last radius is also that due to the parabola at the termination of the whole section by the eye of the dome, and the central radius of 46·10 differs only a few inches from the radius of curvature at the apsis of the parabola. It will not have escaped the notice of the members that the angle of inclination of the parabolic axis is the latitude of the place.

The proof of the correctness of these views has been given by the practically perfect agreement between the calculations and the measurements given above, of which the discordancies never exceed three quarters of an inch, and I have compared many more points than are above tabulated, and have taken two complete sections of the dome with corresponding results.

DISCUSSION.

THE PRESIDENT.—With respect to the decorations of the present cathedral, Mr. Penrose only referred to the dome—a small part of the whole subject but a great part in itself. I deem it a happy augury of what we may anticipate, when two such eminent masters as the President of the Royal Academy, and Mr. Edward Poynter, have agreed to work together to adorn the dome. I believe I am right in stating that both those artists are engaged upon their studies for this work, and I venture to think that, with men so experienced, the question of the dome will be settled in a very happy way.

MR. W. WATKISS LLOYD.—I should be very glad if I could add to the interest of the subject, but though I have read the Paper, it does not appear to afford much to quarrel with. We must wish all success to the endeavours that are being made to render St. Paul's a worthy centre of that common feeling which unites all England, I may say, in what this edifice is chiefly the symbol of. When the dome is fully decorated, I think we may look to the key-note of the whole thing having been decided upon, and the rest of the building can be made to harmonize with it.

JOHN WHICHCORD, F.S.A., *Vice-President*.—I should like to hear something more about the hanging of the bells. It is a matter of secondary interest to the decoration of the dome, doubtless, but still it is a matter we are all interested in. I understood from Mr. Penrose, that the framing provided for those bells has resulted in the least possible vibration—in fact that it was almost intangible, but I have heard it stated, that the pulling of bells in this country and the mode of ringing is peculiar to it. I believe in continental towns there is no instance in which peals of bells are rung in the old-fashioned English style, and there must I think be a material difference in the vibration, whether they are rung in one way or the other.

H. H. STATHAM, *Fellow*.—The bells are not swung round *over* their centre in ringing. They are in the first place rung up by repeated pulls till they are up-side down, and are stopped by a catch from going over; each bell is then left till its turn to strike arrives, when the pull brings it down, and it describes the full circle and ascends to the vertical position on the other side of its swing. It is new to me to hear that the English system of ringing is entirely unknown on the continent; I knew that the Carillon system was much preferred, probably because the Germans are an essentially musical people, and therefore like to have the bells fixed in such a manner that actual music can be played on them. English bell-ringing is not music; it has however a fine effect, and the system of swinging brings out the tone much better than is possible with fixed bells. I should like to suggest with regard to the decoration of St. Paul's, whether it has been considered by those engaged upon it, what effect the mosaic decoration will have upon the aerial perspective of the building. The effect of the mosaic decoration might be to bring down the apparent height of the dome in a manner which would be regretted when it was too late. No doubt if a coloured mosaic floor were carried out, as a part of the scheme, this would materially neutralize the effect of the mosaic in the dome.

E. B. FERREY, *Fellow*.—I would say a word or two about old St. Paul's. In the first place I think the way in which Mr. Penrose proves the deflection of the axis of the choir is very ingenious. We know it is not uncommon, whatever the symbolical reason may be, and as the deflection is not great, it would not be very apparent unless the exact measurement of the angles, by diagonals, were taken. There are various opinions about what the real length of the building was. My own conviction is that Hollar's plan was correct, and that Dugdale's figures are not quite accurate. The late Mr. Ashpitel told me that he considered 690 feet was probably the length of the *churchyard*. As one

proof of the differences which exist as to the actual dimensions of the old building, there is in the possession of the Society of Antiquaries a work called "London Plates," in which the length is described in the margin as 720 feet. There is one remark I would make about the Chapter House. Mr. Penrose seems to think it possible that the four piers shown in Hollar's plan were original and not put in afterwards. I would however call attention to the small size of the Chapter House of old St. Paul's, the internal diameter being according to Hollar's plan only 33 feet, which is very small compared with the Chapter Houses at Westminster and York and elsewhere. There is another curious corroboration of the accuracy of Hollar's plan: Wren in one of the drawings in the Collection of All Souls' College, Oxford, gives the plan of a nave pier to a scale of $\frac{5}{8}$ths. of an inch to the foot, and that corresponds with Hollar's dimensions. Hollar also shows a wide bay a short distance east of the crossing; so does Wren. Then there was a difference of date, the choir proper having been completed in 1240, and the eight bays eastward finished in 1255. The wide bay formed the division between the two *periods*; Hollar's plan likewise shows a westernmost bay next to the crossing, and the easternmost bay to the Lady Chapel of different widths to the other bays. Might not that account for the irregularity of intercolumination which Wren so much condemned? We know how often in old cathedrals the bay next the crossing is of less width than the others, to give greater strength to the central tower. There is the most extraordinary variety in the old views of St. Paul's. In the interesting collection of drawings of old London (belonging to Mr. Crace), there is one view of old St. Paul's in the time of Edward VI., and that shows a building of much shorter dimensions than any of Hollar's views. In fact nearly all the older views I have seen show about half a dozen bays to the nave, and the same number to the choir, but there cannot be a doubt Hollar was right in showing the twelve bays to the nave and twelve to the choir.

E. C. Robins, F.S.A., *Fellow.*—With reference to the introduction of mosaic in the decoration of St. Paul's dome, I may remark that having recently been in Rome, and having been interested in what the late Mr. Cockerell stated on this subject, I noticed the effect of some of the highly coloured domes of that city and particularly of St. Peter's, which is supported by great richness of coloured decoration distributed throughout the entire interior. This dome appears to me of considerably less altitude than that of St. Paul's, although as a matter of fact it is much loftier. The brilliancy of the colours and gilding, and the brightness of the light, make the ceiling appear much lower than it is. The question is whether in the case of St. Paul's it would be a benefit or an injury to make the dome appear less lofty? Considering that our atmosphere here is not nearly so clear or so light as that of Italy, and that the introduction of colour in one part of the building will be followed by its introduction in other parts, I do not think it would have a disadvantageous effect upon St. Paul's, but rather the contrary. Again the paintings in the dome of St. Paul's are arranged with a back-ground formed by a series of inclined columns united by semi-circular arches—the effect being to give an unnatural perspective of an improbable construction. I did not observe this in the Roman churches, where the domes are arranged either in panels radiating from the central eye, or they represent an open sky, with figures of men and angels, of clouds and azure sky; the idea being expansion rather than contraction. The dome of St. Peter's itself is of the former kind, where all the panels radiate from the centre in a common-place manner. I think the late Mr. Stevens' design has hit the right idea, he has avoided the representation of architecture in an unbuildable form by the introduction of independent groups of architectural ornamentation, dividing the dome vertically at different points, and then uniting the whole into one composition by a series of circular panels for pictures of different heights and sizes. The harmonious association of the colours of the groups of ornament and subject pictures will exercise the genius of Sir Frederick Leighton and his colleague.

H. C. Boyes, *Associate.*—We are told that Wren took more ground for the north side of the new cathedral than was occupied by the old one. It seems if the line of nave of the old cathedral, shown on the plan, were prolonged and the axis not made to deviate, that would give the new plan considerably more ground to the north, and would not affect or be affected by any of the discoveries made by Mr. Penrose, or the accuracy of the whole plan west of the choir. As shown on the plan I do not see that much more ground is taken to the north by the new cathedral than by the old. I think Mr. Penrose said he expected to find traces of the old St. Paul's Cross, which would help to fix the position of the east end. Until this is definitely ascertained the evidence is insufficient to prove the deflection of the axis of the choir.

The President.—With respect to the axis, Mr. Penrose has established to my mind distinctly that there was a deflection. Now the deep earnestness with which architects of the Middle Ages designed their buildings is admitted, and finding this fact coincident, I think it shows distinctly that there must have been a well understood reason for it. I thought Mr. Benjamin Webb might have told us that there was some symbolical reason; and I may suggest one that has occurred to many. In all representations of the crucifixion of Our Lord, the head declines over the right shoulder, and assuming the east end of the cathedral to represent the head of the cross, the deflection to the north might be taken as typical of that declination.

Rev. B. Webb, F.S.A., *Hon. Associate.*—My tongue is tied, inasmuch as I am one of the defeated minority of the Restoration Committee. I can, however, express an earnest hope that the experiment which is about to be tried, may be as successful as its best friends could wish. As to the symbolism of the declination of the axis, I believe it had its origin amongst those older ritualists (in the proper sense of the term), who were students of ancient ritual and of church arrangements in a scientific point of view. It was considered that the deflection, which was almost always on the north side, was intended to represent the declination of the sacred head on that side of the cross. In my younger days I thought that was the real origin of the arrangement, but longer experience has made me doubt it. My present view is that the difference of axis is more due to the imperfect method of setting out of the old architects than to intention on their part.

F. C. Penrose, M.A., *Past Vice-President.*—Firstly, as to the bells. I stated in the Paper that the vibration in the tower caused by the swinging of the bells was practically insensible; the tower itself is so massive. I am not saying that in a light or ill-constructed tower the *setting up* and turning over of that enormous mass of metal would not be hazardous. In the ringing, the bells are gradually set up, mouth upwards, some ten degrees beyond their vertical position, and are stopped by a check from swinging over. With a pull of the ropes the bells come down in their proper order, and another pull at the right time sends them up again over the centre. So the process is for each bell to be set up on one side, and then rung and set up again on the other side. Then as to the effect which the mosaic will have upon the perspective of the dome. I believe myself the effect will be very considerably to enlarge the appearance of the dome. We have already two of the spandrils filled with mosaic; and those two arches, whenever I look at them, appear to me to be broader and wider than those which are plain. I fully believe the effect of carrying out the mosaic still further will be to enlarge the apparent size of the dome, for it never looks so small as when there is fog in the building. It will be very different, even on moderately dull days, when there is a large surface of gold ground to reflect the light. St. Peter's dome may not look all its size, but I think that is not owing to the mosaic, but to the light and other circumstances, yet I cannot say I felt it looked smaller than St. Paul's; but of the two I think St. Paul's looks to greater relative advantage in point of size. Stevens's scheme for the treatment of the dome is an admirable one; and I trust,

when the cartoons are placed in the cathedral, that it will be considered the best solution of the problem. With regard to Hollar's plan I believe in its general accuracy; but the Chapter House was larger than Mr. Ferrey supposes from Hollar's plan. It must have been 40 feet in internal measure. The four piers represented on the plan belong to the undercroft; it was a building of two storeys and those four piers belong to the lower storey. The mosaic pavement referred to is that of the crypt. It has been prepared at Woking, by female prisoners there, for whom it is necessary to find some occupation; and the authorities are glad to have that occupation for them. The work is done with great skill and patience from full-size cartoons, which I prepare for them, and generally speaking is well executed. The President asked about the curvature of the dome: If the dome had been really spherical, when it came to the eye the crown would appear to be depressed and look unsatisfactory; therefore Wren decided it should have a certain amount of pitch at the top. The dome at Florence has a considerable lift at the crown; but that, I believe, is the arc of a circle. I think Wren was wise in adopting an ever varying parabolic curve to effect his end, especially when taken in connection with the happy way in which he joined it tangentially to the inclined lines of the drum. The sides of the drum, for the purposes of strength, are inclined conically. He devised a curve, which took this line up exactly, and brought it up to the finish by means of a figure, combining unity with variety. For convenience of execution he translated the theoretic curve into arcs of three circles—never, however, differing sensibly from the parabola. On the subject of the deflection of the axis, Professor Lewis has added to my list several additional instances, and particularly that of St. Mary's, Guildford, where there is a deflection to the extent of 3° 30′, which is very near that wanted for old St. Paul's, (which is 3° 55′). Apart from any symbolical notion, such deflexion improves the perspective in structures of very great length. If you look down a straight road with poplar trees at equal distances on each side, it is immaterial to the appearance of the length of the road whether there are 500 trees or 1500. The last 1000 will produce practically no effect upon the perspective at all. In the same way, in a church with a straight axis having a long arcade, the effect produced on the perspective by the last arches is very slight when viewed from the further end; but if the line is deflected, then those piers and arches become on one side more exposed to view, and produce a much more effective perspective. I have several times noted this in such cathedrals as Lichfield, where the deflection is considerable and sensible. A few words in conclusion about the traces just found of the cloisters. Generally speaking the foundations of the old building were either *rooted* up entirely, or reduced to a very low level indeed; but where the remains of the cloister occur, they were found covered with not more than two feet of soil. Whilst the cathedral was being rebuilt, the convocation-house, which is said to have been upon part of the cloisters, was repaired; and in the Library of Lambeth Palace there is a manuscript, by one Bateman, referring to works about the cathedral between 1666 to 1700, which distinctly gives the cost at which it was repaired; and we found traces of drains and other circumstances which showed that this part of the building was used subsequently to the fire of London, *i. e.*, in the time of Charles II. and James II. There Dr. Simpson, the librarian of St. Paul's Cathedral, has found a document showing that some ecclesiastical censures were passed in the reigns of James II., in the Chapter House; but it is certain that the present Chapter House was not built till the time of Queen Anne, confirming Bateman's statement that a temporary convocation house was provided in the cloister.

VI.—THE CONNECTION BETWEEN ANCIENT ART AND THE ANCIENT GEOMETRY AS ILLUSTRATED BY WORKS OF THE AGE OF PERICLES. By John Pennethorne.

Mr. President and Gentlemen,—I must ask your indulgence while I endeavour to bring to your notice some of the connecting links that formerly existed between ancient Art and the Greek Geometry; and although I believe the subject to be capable of clear demonstration, as every Greek marble fragment bears testimony to the fact of such connection, yet I should not presume to bring my own researches to the notice of the Royal Institute of British Architects in a written Paper, had I not been invited to endeavour to place before you in a simple form a few of the results of the calculations which have been stated in a work which I have published, entitled, "The Geometry and Optics of Ancient Architecture,"* and to prove by evidence, that the statements made therein are correct, and that complete harmony exists between the few passages in the writings of Plato, of Aristotle, of Vitruvius, of Philo, and of other authorities which refer to the theory of ancient Art, and the facts that can be deduced by measurement from the architectural remains in the Athenian Acropolis, which were calculated and executed by the architects of the age of Pericles.

The subject of the work I refer to is confined entirely to ancient architecture, and closes with the Christian era, so that it in no degree touches upon the questions of modern architecture, in which all the requirements are different, but it is simply an attempt to interpret some of the Art problems, which the Greek architects have left engraved in mathematical lines upon every marble fragment of the Parthenon, of the Propylæa, and of other designs, and I have done this in the same spirit that we are trying, from the hieroglyphics and from the arrow-headed characters, to restore the languages and the literature of Egypt and of Assyria, without any expectation of introducing into Europe the civilization of those ancient Empires.

We must therefore dismiss from our minds all ideas of reviving Greek architecture in its original form, and must simply look upon the Greek Temples as ancient works of art, in the same manner that we consider the Philosophy of Plato and of Aristotle, or the Geometry of Euclid, as a kind of ancient foundation upon which modern thought can rest and expand; yet possibly in Greek Art, after it has been winnowed of all that is inapplicable to modern times, some ideas may be found to remain that could in themselves be made to apply to the art of all ages.

Egyptian Architecture.

The subject we have now to consider naturally commences with Egypt, where Aristotle informs us "that the Mathematics were born, because the Priests there enjoyed the privilege of being detached from the affairs of life, and had leisure to devote themselves to study," and the evidence is I believe sufficient to prove that the mathematics were not only born, but were cultivated in Egypt with considerable success, or the Greeks would not have studied in the Egyptian Universities, neither should we have preserved to us in the British Museum a Papyrus treating of the Egyptian geometry and arithmetic; but the existing Egyptian monuments when examined will, I believe, also confirm the early tradition of the Greeks, both as to the origin of the Geometry and of the Arts of Greece.

In the temples and in the tombs at Thebes are to be found some early and simple ideas of

* Presented to the Institute by the Author.

proportion, so far as the making of lines commensurable one with another, with the selecting of such combinations as produced harmony in the proportions, and in the horizontal lines, in the outlines of the shafts of the columns, in the curved sections through the cornices, and in the vaulted ceilings in the tombs, we have certainly varieties of curves traced with mathematical care. But to these I shall again refer, and for the present I will confine your attention to the first given proportions of the Egyptian sculpture and architecture.

In the works of Monsieur Prisse d'Avennes and Herr Lepsius, several examples are given of certain canons of proportion for the human figure which were adopted by the Egyptians for designing their sculpture. The example I have selected (Plate 1, Fig. 1) divides the whole height of a man into 19 parts, making the head = 3 parts, the foot = 3 parts, &c. : and it is simply from the fact that certain canons of proportion were selected for the human figure that I now refer to the length, the width, and the heights in the principal chambers in the tombs of the kings at Thebes, or rather in the excavated palaces, which are also generally proportioned in aliquot parts and executed and finished in the most elaborate manner, thus taking Plate 1, Fig. 2, the principal chamber in the Tomb of Sethee I :—

The length = 18 parts, the width = 11 parts, and the height = 11 parts.

Plate 1, Fig. 3, is a plan and section of another of these excavated chambers. This example does not divide into the usual aliquot parts, but the length, the width, and the height of the chamber can be expressed by the 11th Prob. Euclid, book 2. I simply give the measurements.

Plate 1, Fig. 5 shows the columns and the entablatures of the inner and the outer courts of the Temple at Medinet Haboo, these are also executed in aliquot parts :—

	Whole Height.	Column.	Entablature.
The Inner Court . . .	14 parts .	11 parts .	3 parts
The Outer Court . . .	13 parts .	10 parts .	3 parts

In all this there is very little more than those ideas of natural proportion that may be found in many works of architecture, and which might be illustrated from the cathedrals of Europe, as well as from the tombs and the temples of Egypt, but there is a tendency in both Egyptian and in Greek architecture to make the lines commensurable one with another, and to avoid as much as possible incommensurable lines and angles. But I need not dwell longer upon Egypt, for as Egypt declined, other schools of geometry and of art were destined to rise in succession into importance.

Thales, B.C. 640, after studying in Egypt became the founder at Miletus of the Ionian School of Philosophy, in which was cultivated, earlier than in other parts of Greece, every branch of the mathematics and of the geometry that we now find to have been applied to ancient architecture.

Among the list of names distinguished in science who studied at Miletus we meet with Pythagoras, the founder of the School of Philosophy in Magna Græcia, B.C. 590, and with Anaxagoras, B.C. 480, the friend and instructor of Pericles, and one of the first geometricians who settled in Athens, and there founded the Athenian school of art and science. We thus perceive that from the earliest period of history until the final conquest of Egypt by the Persians under Cambyses, in B.C. 525, the arts and sciences were cultivated with success by the Egyptian priests, and that the Greeks looked to them as their instructors in geometry and in architecture ; after that, for a short time, the sciences were cultivated in Ionia, when a second Persian invasion under Xerxes, B.C. 480, caused nearly all the cities and temples in Ionia to be destroyed, as well as the temples in the Acropolis of Athens. Ultimately, by the energy of the Athenians, Xerxes was defeated at the battles of Marathon and Salamis, and finally forced back from the shores of Europe ; Athens at once

Fig. 1.

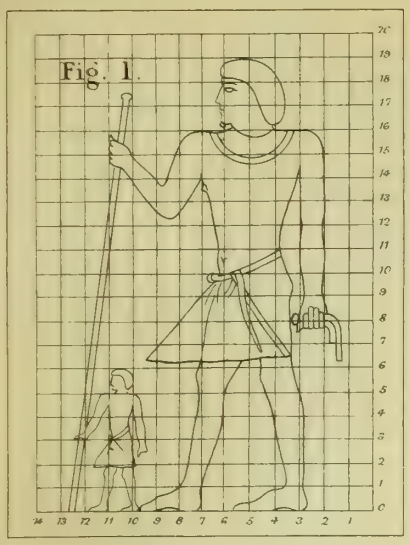

Fig. 2.

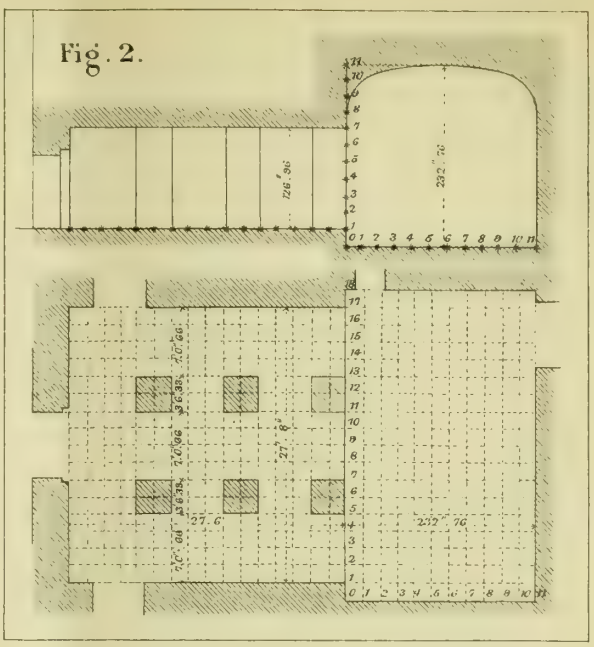

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Fig. 3.

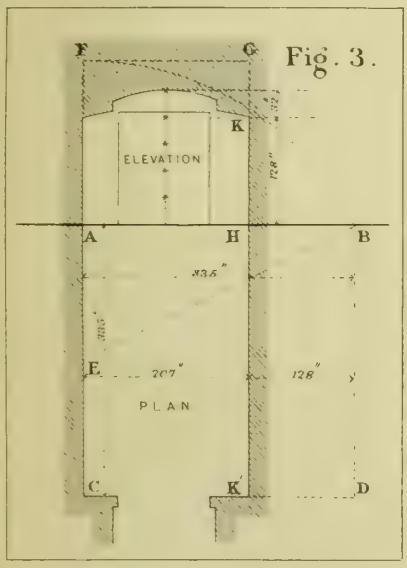

Fig. 4.

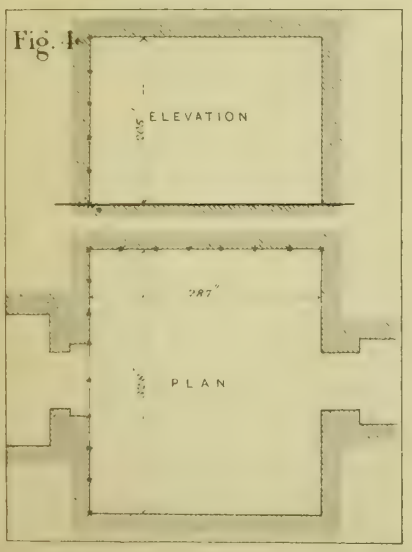

Fig. 5.

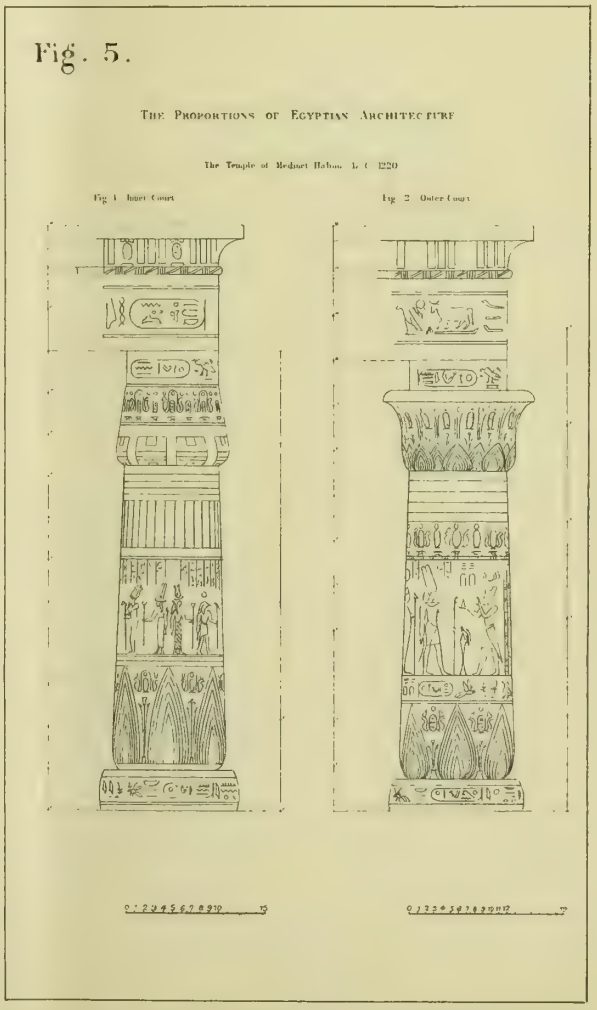

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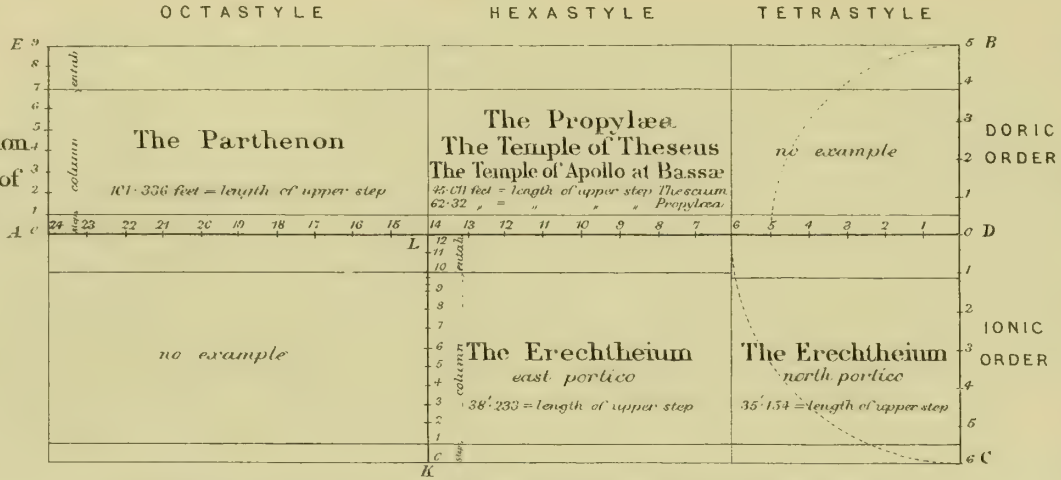
Fig. 1.

The given Canon of Proportion of the Athenian Porticoes.



Divide the line A D into 24 parts, and let the length of the Upper step of the

Octastyle	Hexastyle	Tetrastyle Porticoes
be equal to	10 parts	8 parts	6 parts

Let the whole height of Doric Porticoes D B = 5 parts = A E Let the whole height of Ionic Porticoes D C = 6 parts = K L

In the Doric Porticoes

let the whole height A E	=	9 parts
let the height of the steps	=	1 "
" " Columns	=	6 "
" " Entablature	=	2 "

In the East Ionic Portico of the Erechtheium

let the whole height K L	=	12 parts
let the height of the Steps	=	1 "
" " Columns	=	9 "
" " Entablature	=	2 "

In the North Ionic Portico of the Erechtheium

let the whole height K L	=	12 parts
let the height of the Steps	=	1 "
" " Columns	=	$8\frac{2}{3}$ "
" " Entablature including the Acroteria	=	$2\frac{1}{3}$ "

In the Executed Porticoes these dimensions are slightly changed by calculation, and certain small quantities are either taken from or added to the heights here given.

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The given projections of the several Athenian Porticoes, namely the Steps and the Details of the Entablatures.

these projections traced upon the Horizontal plane undergo no corrections.

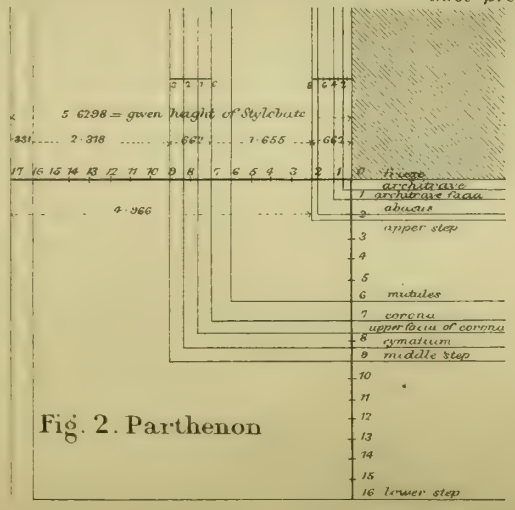


Fig. 2. Parthenon

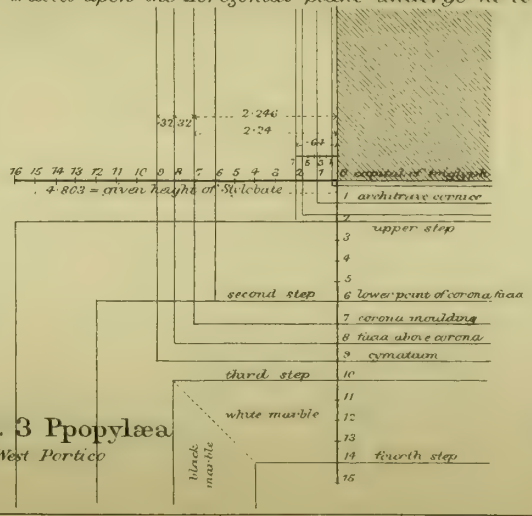


Fig. 3 Ppopylæa
West Portico

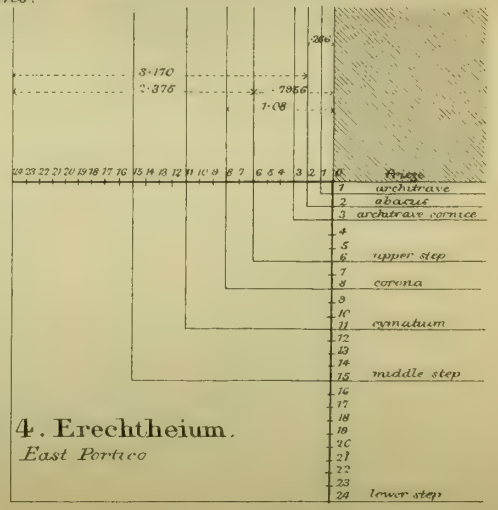


Fig. 4. Erechtheium.
East Portico

Lith^d by C F Kell, London E C

became the leading power among the states of Greece. Then upon the ruins of the early Temples in the Acropolis of Athens, were erected the present works of Greek art, and to this school of geometry, of sculpture and of architecture I must now direct your attention, commencing with the Greek theory of proportion.

Greek Architecture.

THE FIRST GIVEN PROPORTIONS OF THE ATHENIAN PORTICOES.—Plato, in his Timæus, says, "The composition of the world received one whole of each of these four natures—fire and air, earth and water—for its composing artificer constituted it from all fire, water, air and earth, for he concluded it would thus be a perfect whole, if formed from perfect parts."

This harmony of proportion which the geometricians discovered in the forms they investigated, and which the philosophers conceived as existing in the composition of the world, the ancient architects established as a fundamental principle in their architecture. Thus Vitruvius says, "The composition of temples is governed by the laws of symmetry, which an architect ought well to understand: this arises from proportion. Proportion is the correspondence of the measures of all the parts of a work and of the whole configuration, from which correspondence symmetry is produced; for a building cannot be well composed without the rules of symmetry and proportion, nor unless the members, as in a well formed human body, have a perfect agreement."

The information to be derived from ancient sources, except from the actual remains of Greek architecture, is slight, but the works of the age of Pericles were executed with such extreme precision that we are able from them inductively to recover the original canon of proportions of the Athenian porticoes; and this we can do by simply eliminating the small irrational quantities that by measurement are found to exist in the whole height of each temple and in the heights of the steps, the columns, and the entablatures, when compared with the length of the upper step in any given portico and of substituting instead the nearest commensurable magnitudes. These small irrational quantities are found to vary between zero and a few inches in the porticoes of the Parthenon, of the Propylæa, of the Erechtheium, &c., and are the result of careful calculations to be hereafter explained; but when they are effaced, then all the Greek porticoes harmonize, and can be given in a simple diagram, which is really the given Athenian canon of proportions of the Greek porticoes. With these given quantities there is no difficulty in arriving by calculation at the true executed dimensions in every example, and the variations between the first given quantities and the calculated executed dimensions are the additions and diminutions referred to by Plato, by Aristotle, and by Vitruvius.

Plate 2, Fig. 1, the Canon of Proportion of the Athenian Porticoes. Divide the line A D into 24 parts, and let the length of the upper step of the

Octastyle	Hexastyle	Tetrastyle, porticoes be
=10 parts	=8 parts	=6 parts.

Let the whole height of the Doric Porticoes D B = 5 parts = A E. Let the whole height of the Ionic Porticoes D C = 6 parts = K L.

In the Doric Porticoes the whole height A E is found to divide into 9 aliquot parts.

The height of the Steps	= 1 part.	
„ Column	= 6	„
„ Entablature	= 2	„
A E	= 9	„

In the Ionic Porticoes the whole height K L is found to divide into 12 aliquot parts.

The height of the Steps	= 1 part.	
„ Column	= 9	„
„ Entablature	= 2	„
K L	= 12	„

These proportions of the porticoes are simply the first given quantities, and they are explained more in detail in my book.*

THE PROJECTIONS.—In the Doric and Ionic porticoes the total horizontal projection from the frieze to the lower step is made equal to $\frac{1}{9}$ of the whole given height of the porticoes, then for the details of the steps, of the entablature, and of the inclination inwards of the first masses, the whole projection is divided into some given number of aliquot parts, as for example, in the Parthenon, 17 parts; in the Propylæa, 16 parts; in the Erechtheium, 24 parts; and the details of the projections are regulated by these numbers (see Plate 2, Figs. 2, 3, 4). These horizontal dimensions undergo no corrections, but are executed as they are first given.

The working out of these first given proportions of the porticoes was evidently the result of study and careful observation. But to attempt to explain the reason why certain proportions should produce that agreeable impression on the eye, which by universal consent they were acknowledged to do, is I feel impossible. In music we can give no reason why certain harmonies and scales should produce an agreeable impression on the ear, or why many other intervals that might be selected would be discordant—as Aristotle says, "Posterior Analytics," chap. 3 :—

"Neither is all science demonstrative, but the science of things immediate is indemonstrable."

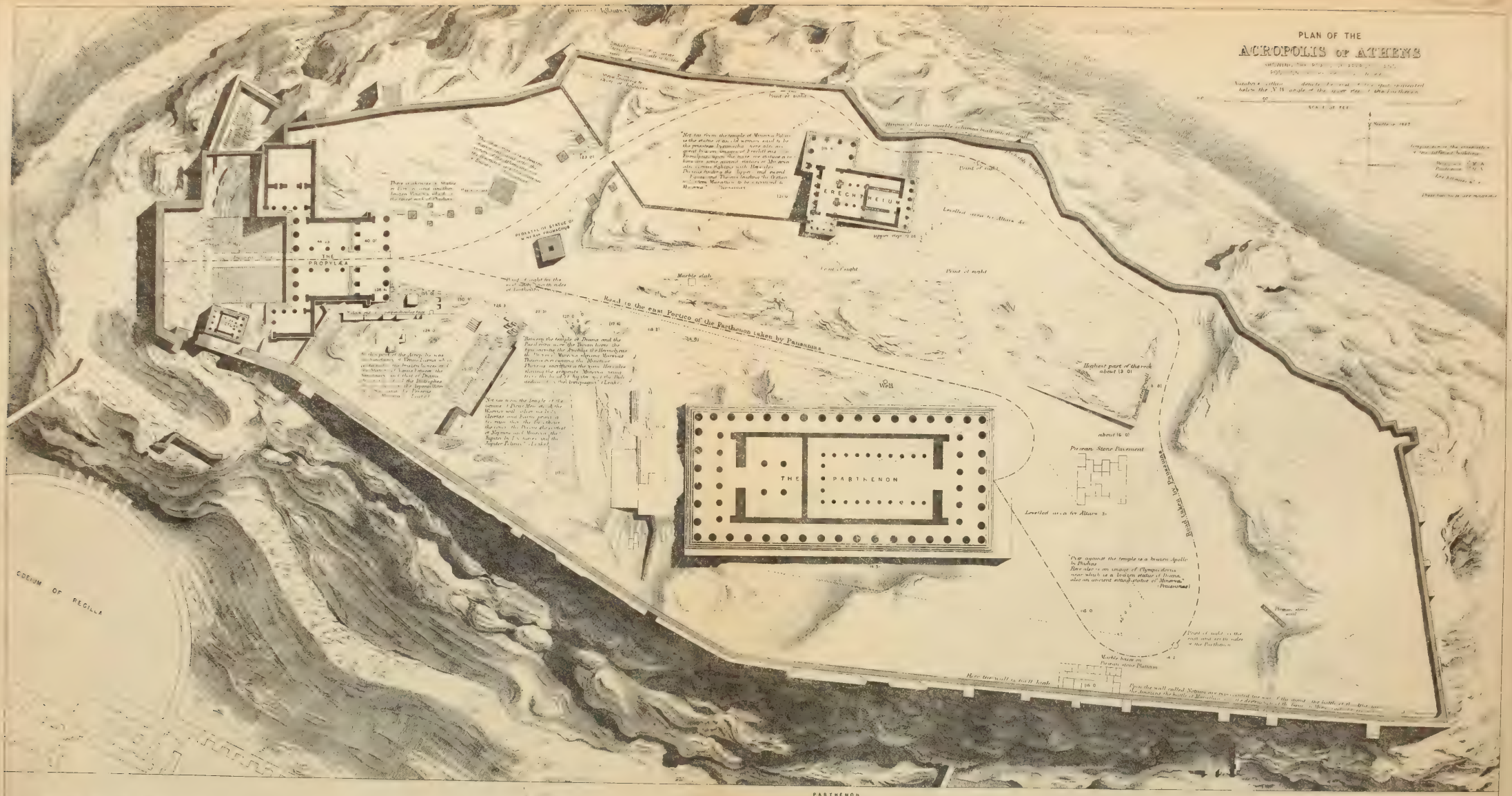
But I must leave these questions and proceed to the consideration of the important subject of Position, which naturally includes the points of sight, and the calculations of the apparent magnitudes.

POSITION.—It is impossible to study the Egyptian and the Greek temples without perceiving that great care was taken by the architects in the arrangement of the position of the Propylæa, the roads of approach, and the sculpture surrounding the principal designs; thus in Egypt, both at Karnak and at Luxor, the roads of approach to those temples are marked by long lines of sphinxes, leading up to the Propylæa with their statues, flags and obelisks, marking the entrance to the temple or the Palace, and the spectator was led to approach these designs from certain pre-determined positions. In the Egyptian examples the Propylæa and roads of approach are placed centrally, and the spectator enters at once into the inner courts and halls of the temple, which are enriched with columns, statues and paintings. The design is arranged more for internal than external effect.

The Grecian temples were generally surrounded by external colonnades, supporting an entablature enriched with sculpture, both in the frieze, and in the pediments; and the external appearance of the design was carefully studied.

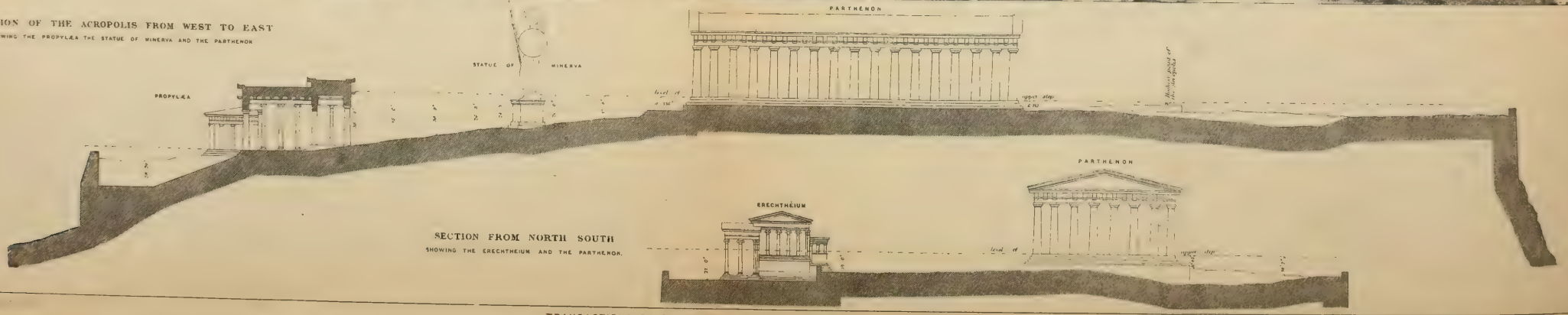
This change in the arrangement of the designs between Egypt and Greece, led to a corresponding change in the position of the Propylæa and roads of approach to the several temples, which instead of being central, as we have seen was the case in Egypt, were in Greece planned so as to offer an angular view of the temple to the eye of the spectator. Thus Colonel Leake in the "Topography of Athens" (page 516), when speaking of the Olympium at Athens, says :—"The approach to it, as in the instance of the Parthenon, was from the west. The gate of Hadrian formed an entrance to the peribolus at the north-western angle, and presented to the spectator the same kind of view that he obtained of the Parthenon on emerging from the Propylæa. In both instances his eye, by comprehending at once a view of one of the fronts and one of the sides of the building, enjoyed a more imposing prospect of those magnificent edifices than could have been presented to him by an approach immediately in front. There was a similar approach at the Temples of Minerva at Sunium and Priene, and at the Panhellenium of Ægina."

* "The Geometry and Optics of Ancient Architecture," Part I., Plate 3.



SECTION OF THE ACROPOLIS FROM WEST TO EAST

SHOWING THE PROPYLÆA THE STATUE OF MINERVA AND THE PARTHENON



SECTION FROM NORTH SOUTH

SHOWING THE ERECHTHEIUM AND THE PARTHENON.

THE PLAN OF THE ACROPOLIS OF ATHENS (Plate 3).—The relative positions of the Propylæa, of the Parthenon and of the Erechtheium, were the same in the old plan of the Acropolis, before the temples were destroyed by the Persians, as in the restored plan when the edifices were rebuilt under the administration of Pericles. The Greeks, whenever it was possible, from the earliest period always endeavoured by the arrangement of the gateways, the roads, the sculpture, and the artificial platforms to present each design to the eye of the spectator, so that it might be seen from a favourable angular point of view.

From its position the Propylæa to the Acropolis at Athens was an exception to this rule, and the west portion of the vestibule could only be seen from, and was calculated for, a central point of view; but passing through the vestibule of the Propylæa, the first important monument that presented itself was the statue of Minerva Promachus, by Phidias, which was 70 feet high, including the pedestal. This statue was placed nearly in a line with the centre of the east portico of the Propylæa, and 120 ft. in front of it, and the pedestal presented an angular view to the eye of the spectator; near the base of this statue we obtain an uninterrupted angular view of the Parthenon, embracing the west portico and the north return side, and on the platform at the east end, and near the south fortification wall —where, according to Pausanias, were represented the wars of the giants, the battle of the Athenians with the Amazons, and the battle of Marathon—there is a second angular view embracing the east portico and the south return side.

Similarly the plan shows sufficient space to allow of angular points of view both for the east and the north porticoes of the Erechtheium.

The facts relating to the canon of proportions of the several porticoes—to the setting out of the projections, and to the arrangement of the relative positions of the temples with regard to the Propylæa and sculpture to suit certain favourable angular points of view—can all be derived from direct observations, but we have now to consider the subject of the given points of sight—the apparent magnitudes, and the calculations that were made by the Greek architects, in order that the designs should appear to the spectators to be as perfect in apparent proportions as they were first conceived in the mind of the architect.

THE POINTS OF SIGHT AND THE APPARENT PROPORTIONS.—The subject of the apparent proportions was certainly considered anciently as an important part of Greek architecture, but each step in the calculations must, I feel, be clearly proved before the theory will be received as true.

The idea of a point of sight is not new, but that the Greeks should have corrected all the apparent vertical magnitudes, so that in the finished design they should all be commensurable one with another and with the apparent whole height, and then have trigonometrically calculated and corrected all the executed heights in the finished design to suit a favourable given point of view, requires actual proof. The evidence for what is stated will be based:—

Firstly,—Upon the written statements of Plato, of Aristotle, and of Vitruvius, who all clearly refer to a favourable point of view, to the apparent magnitudes, and to the corrections made in the original design by certain "additions and diminutions."

Secondly,—The measurements of the Athenian porticoes shew clearly that certain small plus and minus quantities have been either added to, or taken from the original dimensions of the porticoes, as given in the canon of proportion (Plate 2, Fig. 1).

Thirdly,—By simple trigonometrical calculations commencing with the given quantities we must arrive at the true executed dimensions, which will be found in every case to agree with the measurements.

1.—Plato, in the Sophist,* says :—

GUEST.—"I now seem to see two kinds of the imitative Art. I see that one is the assimilative Art—and this especially takes place when an Artist, according to the proportions of the original in length, breadth, and depth, and, moreover, by adding fitting colours, works out the production of an imitation." (This is the case in the Egyptian tombs.)

THEÆ.—"What, then, do not all Artists endeavour to do this?"

GUEST.—"Not such as mould or paint any great work. For if they should give the true proportion of beautiful things, you know that the upper parts would appear smaller than is fitting, and the lower parts larger, through the former being seen by us at a distance, and the latter close at hand."

THEÆ.—"Entirely so."

GUEST.—"Do not, then, the Artists, bidding farewell to truth, now work out not real proportions, but such as seem to be beautiful in their representations?" (namely, apparent proportions.)

THEÆ.—"Entirely so."

GUEST.—"Is it not then just, as being at least probable, to call one an image?"

THEÆ.—"Yes."

GUEST.—"And we must call the part of the imitative Art subsequent to this, as we have said above, assimilative."

THEÆ.—"We must so call it."

GUEST.—"But what shall we call that which appears, indeed, similar to the beautiful, through *the view taken from a favourable point*, but which, when seen by him who has the power to look on things sufficiently, is not like that to which it professes to be like? Must we not call it an appearance, since it appears to be, but is not like?"

THEÆ.—"Undoubtedly."

GUEST.—"Is not this part abundantly to be found in Painting, and in the whole of the imitative Art?"

Aristotle defines the beautiful to consist in magnitude and in order; magnitude being a relative term is made to comprise the whole "extent of that scale which the *eye* is able *to embrace at one view*." Again in the Nicomachean Ethics, book 2, chap. 1, he says—"Every scientific man will avoid excess and defect, whence it is usual to say of works that are well finished that nothing can be *added or taken away from them:* acknowledging by this that *excess and defect* corrupt that which is excellent in them." In the Parthenon and in other designs seen from angular points of view, the diagonal line traced upon the plan of the temple is the line of greatest extent which the eye is able to embrace at one view; in the Monument of Lysicrates, and in the case of the statue of Minerva Promachus, the whole height becomes the line of greatest extent. Vitruvius enters more into detail and refers more especially to architecture. He says, in book VI., chap. 2 :—"After having determined upon such proportions as the necessity for the commensuration of the parts with the entire building seems to require, the greatest judgment must be exercised in—

"Adapting them to the nature of the spot," (position)

"The use to which the edifices are designed,

"The appearance they ought to assume,"

by making such *additions* or *diminutions* that although the proportions are not strictly what they ought to be, the eye may not be conscious wherein they fail."

"Under every peculiar circumstance great judgment is necessary in *calculating* the effect that will ultimately be produced."

"Since, therefore, objects sometimes assume an appearance of being otherwise than they really are, it will not be denied that additions and diminutions may be made, as the nature of the situation, or the exigencies of particular occasions require, in such a manner that the deviation from the general laws of proportion will not be perceptible."

"It therefore becomes necessary in the first place to institute *laws of Proportion*, upon *which all our calculations must be founded*."

---

* Plato, translated by G. Burgess, M.A., Vol. III—Bohn, London.

"According to these the ground plan, exhibiting the length and breadth of the whole work, and the several parts of it, must be formed."

"When the magnitude of these is once determined, the parts must be arranged so as to produce that external beauty which suffers no doubt to arise in the minds of those who examine it to the want of proportion in any part."

"The mode of the symmetry, therefore, being first fixed" (that is, the first lines of the design being traced commensurable one with another), "the alterations" (namely, the diminutions and additions) "are to be made thereon."

Vitruvius also says in Book III., Chap, 2 :—"Beauty being the province of the eye, which if not satisfied by the due proportion and augmentation of the members—correcting apparent deficiencies with proper additions—the aspect will appear coarse and displeasing."

Thus we find Plato, Aristotle and Vitruvius agree in stating that when large works of art, either of sculpture or of architecture, were designed to be "viewed from favourable points of view," the first given proportions of the design were changed by "additions and diminutions" being made, so that in the finished work, instead of the original design, with all the parts commensurable, we have, as it were, a new design in which the parts are only apparently commensurable.

The Measurements of the Masses of the Greek Porticoes.—We need not trust to the correct interpretation of these passages either in Plato or Vitruvius, for if such "additions and diminutions" were really made upon the original designs by the Athenian architects of the age of Pericles when designing their works of architecture, we must expect, upon a careful examination of such large works as the Parthenon, the Propylæa, the Erechtheium, the Theseium,—in fact, of all architectural works of magnitude executed, either in Greece or in Asia Minor, during the best period of Greek art,—to be able to discover by measurement the actual amount of the variations that were made in the heights of the several members of each design when they were subjected to those corrections which were essential to produce an apparent harmony between all the parts of the finished executed design ; and this is really the case, for in each example when we compare the executed heights, with the heights given in the canon of proportion, the additions and diminutions that were originally made by the Greek architects at once appear. There is no difficulty when the given quantities, on which the calculations are founded, are correctly assumed, in arriving at the same results by calculation that we obtain by measurement, and this we shall now proceed to explain, commencing with the position of the points of sight.

The Position of the Points of Sight.—If the points of sight were not given in position, the calculations and corrections could not be made ; and in the case of the Athenian Acropolis these several points of sight are practically indicated by the relative positions of the Propylæa, the roads of approach, the levels, the arrangement of the sculpture, and the position of the Parthenon and the Erechtheium. (See Plan of the Acropolis, Plate 3.)

With regard to the Parthenon, there is sufficient space left to allow of a north-west angular view to be seen from the road close to the statue of the Minerva Promachus, and also for a south-east angular view to be seen from a point near to the south fortification wall ; in these examples there is sufficient space allowed for the eye to embrace the diagonal line of the Temple (which is the line of greatest extent) within a given horizontal visual angle of 45 degrees, which has therefore been assumed in every example as a given quantity, and the calculations, agreeing with the measurements must prove, not only in the case of the Parthenon, but also of the Erechtheium and of the Propylæa,

and of other Greek designs that this horizontal angle of 45 degrees has been correctly assumed. The Greek idea of having a fixed point of sight, and of making the visual angles of the perspective design commensurable with each other may appear to some minds as a waste of time and of calculation, but the painter, the sculptor, and the architect all considered their designs to suit some favourable points of view, and although the calculations in the case of the Parthenon were made to suit one point of sight, which is essential, yet the spectator moving either to the right or to the left of the calculated point of sight, within the possible limits of a Greek design, scarcely alters the result of the calculations. The spectator was by no means confined to one exact point of view, although it is requisite that a fixed point of view should be determined upon to suit which the calculations were made.

The Calculations of the Apparent Magnitudes.—In Book I., Chap. I., Vitruvius states that "arithmetic assisted by the laws of geometry determines those *abstruse questions* wherein the different *proportions of some parts* to others are involved," and he appears to refer also to the descriptive geometry of three dimensions, for the tracing of the plan and elevation of the design, and also to the perspective view of the same, accurately drawn; and in Book VI., Chap. 2, he refers to the special calculations required for determining the apparent magnitudes and the additions and diminutions that have to be made, as he says, "in such a manner that the *deviation from the general laws of proportion* will not be perceptible."

The Given Quantities.—Before these calculations can be made, certain quantities must be given, or, as Vitruvius says,—"It becomes necessary in the *first place to institute laws of proportion* upon *which all our calculations must be founded.*"

Firstly,—This is done for the Greek porticoes when the first given heights, widths, and projections are all laid down according to a fixed canon of proportion (see Plate 2).

Secondly,—Upon the horizontal plane X Y—"The plan exhibiting the length and breadth of the whole work, and the several parts of it, must be formed," and the position of the point of sight O must also be given upon this plane X Y, "so as to comprise the whole extent of that scale which the eye is able to embrace at one view;" (see Aristotle) in the case of the Parthenon, this will be the diagonal line of the Temple.

Thirdly,—The position of each design upon its artificial platform with regard to the point of sight O, and the height of the upper step either above or below the horizontal plane X Y must be also given.

The Temple is now supposed to be fixed in position with regard to the point of sight—the given dimensions are all commensurable, and if there were no corrections to be made we might at once proceed with the designing of the columns and the entablatures, and this is actually the case in some small designs in Athens, and in the Roman porticoes; but not in the Greek works of magnitude, like the Parthenon and the Propylæa. In these cases certain corrections have to be made by calculation, so that the perspective design may appear to the spectator to be perfect in apparent proportion, and the slight irregularities were thrown into the executed work, where they escaped detection. The horizontal straight lines have also to be converted into convex lines.

The Calculations of the Apparent Magnitudes of the Parthenon.—For a detailed explanation of the calculations for determining the apparent magnitudes of the Parthenon, I must refer to Plate 4, but speaking generally, the calculations are found to assume a twofold character: Firstly, Position, and secondly, the Executed dimensions.

Firstly, as to position.—The first design is given in position on its artificial platform, Plate 4,

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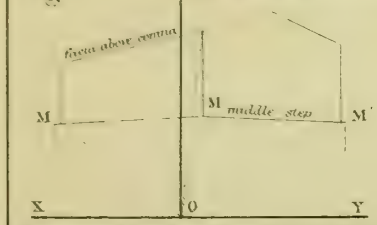
The correction of the Visual Angles

Fig. 1



The first given lines within which the Parthenon was to be designed

The apparent length and breadth of the middle step of the South East angular design at the given height of 9·2 above the horizon determined by calculation.

MOM + MOM' 144564"

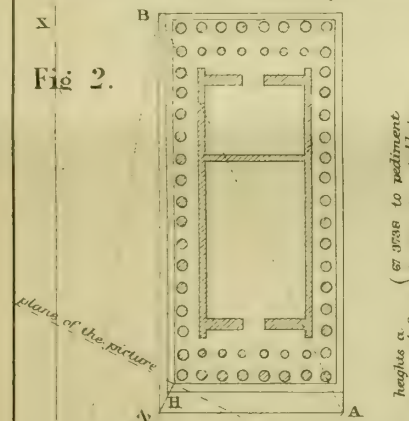
The mean apparent height of the arc AB = 61654

as 61654 : 144564 :: 1 : 2·3447

nearest ratio 3 : 7

$\frac{3 \times 144564}{7}$ = 61956 = the corrected apparent whole height AB Fig 4

Fig. 2.



point of sight for south east angular design 9·2 below the upper step

pavement 14·2 below the upper step

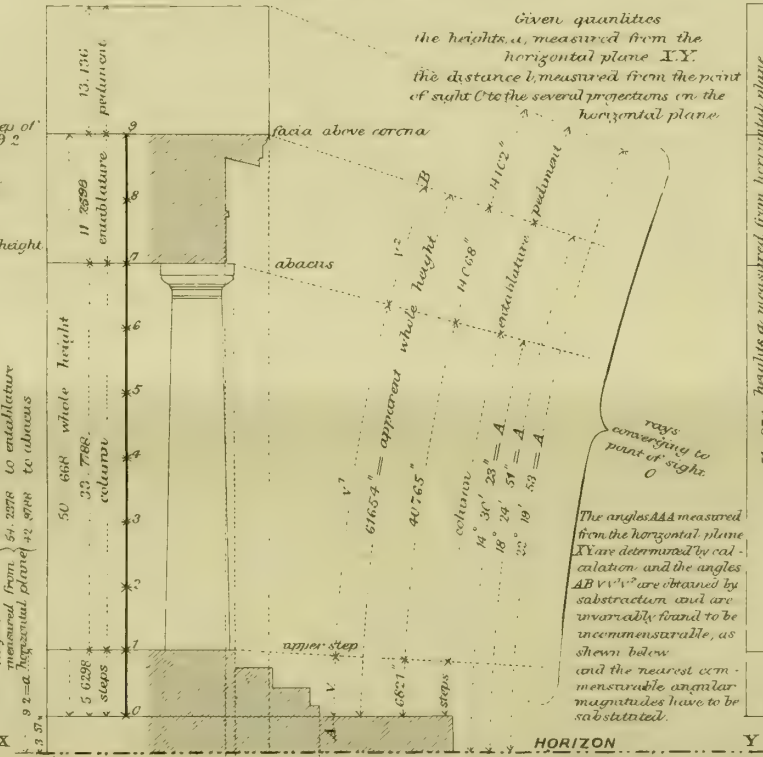
Fig. 3 The first design given in position on the artificial platform, with the vertical heights commensurable, derived from the Canon of Proportion (Plate 2) and the arc AB and the visual angles V V' V² &c are calculated from the form

log tan A = log r + log. a − log b.

Given quantities

the heights a, measured from the horizontal plane XY.

the distance b, measured from the point of sight O to the several projections on the horizontal plane.



widths b		
	158·77 from lowest step	159·19 from lower step
	162·91 from facia above corona	163·06 from pediment
	165·437 from upper step	165·527 from abacus
	166·117 from architrave	

to point of sight O

Dividing the apparent height A B (Fig 3) into 9 parts and reversing the calculations with the angular magnitudes w w' w² corrected we obtain the true executed height's at the angle of the design nearest to the point of sight see Fig 4

apparent whole hᵗ. length and breadth

As 61654 .	144564	. 1 . 2 . 3447	nearest ratio	3	7	
column	height					
As 40765 :	61654	:: 1 : 1 . 512	" "	6	9	
entab	column					
As 14068 :	40765	:: 1 : 2 . 89	" "	2	6	
pedᵐᵗ	entab					
As 14102 :	14068	:: 1 : . 999	" "	1	1	

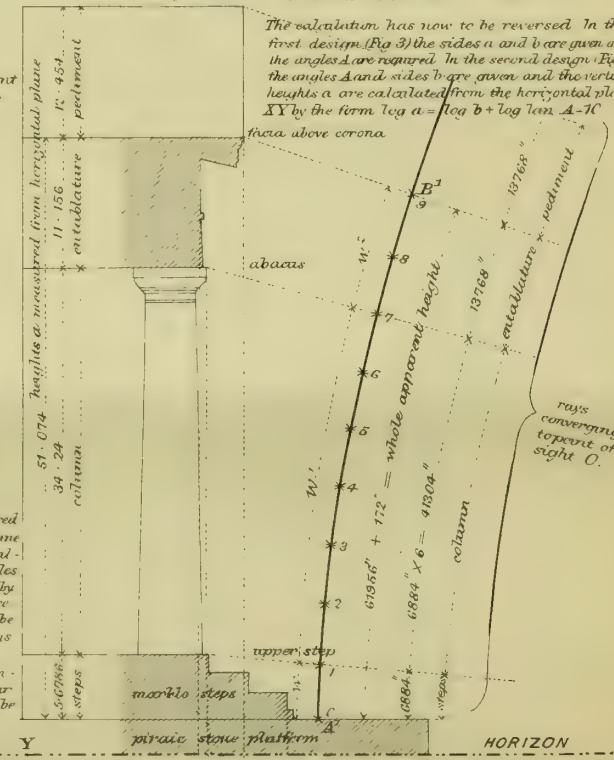
Fig. 4. The corrected apparent Magnitudes

The apparent angular magnitudes w w' w² are all made commensurable, and the slight irregularities are thrown into the height of the executed design

Corrected arc AB = 61956" = 6884 = first modulus of apparent heights

corrected apparent hᵗ of Column	= 6884 × 6 = 41304 = 11°.39'.22" = w'	14°.39'.22" =	angle A
" " Entab.	= 6884 × 2 = 13768 = 3°.49'.28" = w'	18°.31'.42" =	"
" " Stylobate	= 6884 × 1 = 6884 = 1°.54'.44" = w²	3°.10'.58" =	"
" " Pediment	= 6884 × 2 = 13768 = 3°.49'.28"	22°.21'.10" =	"

The calculation has now to be reversed In the first design (Fig 3) the sides a and b are given and the angles A are required. In the second design (Fig 4) the angles A and sides b are given and the vertical heights a are calculated from the horizontal plane XY by the form log a = log b + log tan A–10



widths b		
	159·19 from lower step	
	162·91 from facia above corona	
	165·437 from upper step	
	166·117 from architrave	

to point of sight O

The result of the calculations

1st the dimensions derived from whole hᵗ steps	column	entablature
the Canon of Proportion .	50·668	5·629	33·778	11·259
2nd the calculated dimensions				
giving the executed hᵗ (Fig 4) . .	50·074	5·678	34·24	11·156
3rd the difference between the first and second designs	+ 0·406	+ 0·048	+ 0·462	− 0·103

It was considered better to make the apparent proportions in the perspective design perfect and to throw the slight irregularities into the executed dimensions where the eye would not detect them

John Robinson del.

Lith^d by J. H. Kell. London E.C.

Fig. 1, with the point of sight, and the level of the horizontal plane X Y determined, and the vertical lineal heights (namely) the whole given height, and the heights of the steps, of the columns, and of the entablatures, are all commensurable one with another, and are all derived from the given canon of the proportions. Then the whole apparent height of the arc A B and the apparent heights of the

Steps	Columns	Entablatures
V	V_1	V_2

are calculated with reference to the point of sight O from the

Form log. tan. A = log r + log a — log b.

Given Quantities.

The heights a a a measured from the horizontal plane X Y, and the distance b from the point of sight to the several projections measured also on the horizontal plane.

Determined by Calculations.

1st. The angles A A A measured from the plane X Y, and then by simple subtraction the values of the arc A B and of the angles V V_1 V_2 are ascertained, and these angles are invariably found to be incommensurable quantities, and the nearest commensurable angular magnitudes have to be substituted.

Secondly, as to the executed dimensions.—In the first given design, Plate 4, Fig. 3, the vertical lineal magnitudes are all commensurable, but in the second executed design, Plate 4, Fig. 4, which is intended to be seen perspectively, the apparent magnitudes, namely, the apparent whole height of the arc A_1 B_1 and the apparent heights of the steps W—the columns W_1—the entablature W_2 are all made commensurable by substituting for the apparent irrational quantities in Fig. 3 the nearest rational angular magnitudes, namely :—

The whole height	Steps	Columns	Entab.
arc A_1 B_1	W	W_1	W_2

and the slight irregularities (which are the "additions and diminutions" referred to) are finally thrown by calculation into the executed heights, but to the eye of the spectator there is perfect harmony between all the apparent proportions.

The Calculations to Determine the Executed Dimensions.—The calculations have now to be reversed ; in the first design, Plate 4, Fig. 3, the sides a and b are given, and the angles A A A are required. In the second design the angles A and the side b are given, and the vertical heights a a a calculated from the horizontal plane X Y have to be determined from

The form log a = log b + log. tan. A – 10,

and then by simple subtraction the whole executed height, and the heights of the steps, of the columns, and of the entablature, are ascertained.

The Result of the Calculations.—The results of the calculations at the south-east angle of the Parthenon are given in Plate 4, and shew a perfect agreement between the measured "additions and diminutions" and the calculated dimensions both at the S.E. and N.W. angles of the Parthenon. In the calculations for the Propylæa, and for the porticoes of the Erechtheium, the same character of variations is found to exist between the first given designs and the second executed designs, and is obtained by a similar form of calculations.

The Whole Height.—In the case of the Parthenon where there is an uninterrupted angular view both of the portico and also of the return side, the whole apparent height is not a fixed quantity derived from the first given height obtained from the canon of proportion, but is made commensurable with the apparent length and breadth of the whole mass of the Temple MOM″ + MOM′, (see Plate 4, Fig. 1,) but in other examples, as in the east portico of the Erechtheium, and in the centre portico and north wing of the Propylæa, the whole height becomes a given quantity, as there are no return sides to be considered, and the apparent height A B is therefore a given quantity and requires no correction.

In the Parthenon the given whole height derived from the canon of proportion, Plate 2, Fig. 3, and the apparent whole height made commensurable with the apparent length and breadth of the angular design, Plate 4, Fig. 1, are found to divide into the same number of aliquot parts (9); but it was not considered essential that the numbers should always agree, though it was requisite that no fractional quantities should appear among the apparent magnitudes, and it was essential also that the original dimensions as given in the canon of proportion should be changed as little as possible, and to effect this the nearest ratios were selected.

I have dwelt with some detail on the theory of the apparent proportions because it was evidently considered as an important part of ancient architecture, and was evidently much studied by the Greek architects, and is the principal subject connected with architecture that is referred to by the several ancient authorities. I must now pass on to the second important correction, namely, the conversion of the horizontal straight lines of the temple into convex lines executed practically as the arcs of circles.

The Curvature of the Horizontal Lines.—The second important correction that the Greeks made upon the masses of their architectural designs was the substitution of curved lines in their larger works of architecture, instead of the horizontal straight lines.

Between the years 1835 and 1837 I had satisfied myself that the Athenian Temples were all designed and calculated to be seen from fixed points of view; I had also considered to a certain extent the curvature of the horizontal lines, founded upon the statement in Vitruvius. I returned to Athens to observe more carefully the curves of Greek architecture, fully expecting to find confirmation of what Vitruvius so clearly states, relating to the curvature of the steps and of the architrave, and by simply straining with force 100 ft. of wire along the side of the upper step of the porticoes of the Parthenon the curvature of the lines became visible. Observing in the same manner the line of the architrave, it at once appeared that there was an inward curvature as well as a curvature in the vertical plane, and both for the east and west porticoes this inward curvature was so regular that I conceived it to be a part of the original design. I observed also a difference of level at the angles of the upper step of the Parthenon, but the observed facts relating to the lines of the entablature did not agree with the statement of Vitruvius, and I put the subject of Greek architecture aside for fifteen years, never intending to resume the investigation.

The accurate study of these curved horizontal lines was reserved for Mr. Penrose, who visited Athens in 1846, fully prepared for the investigation. He measured and observed them with all the scientific care and accuracy which the subject required, and in 1851 published the results in a very valuable work upon Greek architecture; as I have hitherto been indebted to Plato and Vitruvius, so now I shall be glad to avail myself of Mr. Penrose's careful researches.

The Observed Facts relating to the Horizontal Curved Lines.—The earliest example

of the curvature of the lines of ancient architecture will, I believe, be found to exist in the lines of the entablature on each of the four sides of the inner court of the temple of Medinet Haboo, B.C. 1220; and before I was aware of the fact of the curvature of the horizontal lines in the designs of the Greek architects, or of the importance of the subject in a mathematical point of view, I found from simple observation, that there appeared to be a very considerable curvature in the horizontal plane of the lines of the cornice on the four sides of the inner court of this temple.

Plate 5, Fig. 1, shews the plan of the roof of the temple as I sketched it in 1834, and it will be seen that the chord of the arc B B, on two sides, is 80 ft. 9 in. in length, and that the amount of curvature in the centre measured from the chord is 8 in. The chord of the arc B B_1, on two sides, is 104-9, and the amount of curvature in the centre measured from the chord $4\frac{1}{2}$ inches.

I did not then devote that attention to the study of the Egyptian curves that I now find the subject requires, as the study of scientific architecture had not presented itself to my mind, but I hope some traveller will carefully examine these Egyptian horizontal curves as well as the curved lines in the shafts of the columns and in the sections of the cornices, for the early traces of the Egyptian geometry are worth collecting.

The Early Parthenon.—Col. Leake says, "It was probably about the eighth century before the Christian era, that the Athenians built the great temple of Minerva in the Acropolis." Mr. Penrose measured the curvature of the lines in the sub-basement of the first temple as follows:—

Length of the front 104·2 ft., amount of curvature in the vertical plane at the centre 0·15 ft.

Length of the flank 221·0 ft., amount of curvature in the vertical plane at the centre 0·233 ft.

This is probably the oldest existing example of the curvature of the horizontal lines of Greek architecture, about four centuries later than the temple at Medinet Haboo, although earlier than the founding of any school of Greek geometry.

But it is in the designs of the Greek architects of the age of Pericles that we meet with the principal development of these curved lines, and fortunately of all the horizontal curves now remaining, the best preserved and the most carefully executed will be found to be in the upper step of the Parthenon, in both the east and west porticoes and on the north and south return sides. These are the curves Mr. Penrose has most accurately observed; the figures given in Plate 5 are all deduced from his measurements, and no attempt has been made to suit the figures to any pre-conceived theories of my own, but some of my early ideas have had to bend before the facts derived from his accurate observations.

The Character of the Horizontal Curved Lines.—Mr. Penrose has not only measured with scientific accuracy the horizontal curves of the Parthenon and of the Temple of Theseus, but he has also, I believe, deduced from his observations the true character of the curved lines in the case of the Parthenon, for when speaking of the curve of the upper step at the east end, he says, "A circle drawn so as to pass as near as possible to all the measured points, taking them in their actual positions, would be subject to an error of only ·0065 ft." The agreement is evidently so close between the measured and the calculated ordinates, for both the east and the west porticoes of the Parthenon, that we may safely identify them as the arcs of similar circles.

Again, when referring to the upper step of the north return side of the Parthenon, Mr. Penrose says, "A circle in the actual building may be drawn so as to coincide with all the measured parts of this curve subject to a maximum error of ·006 foot, excepting in the cases of the 6th and 7th columns from the north-east angle, where the steps have evidently been somewhat injured by the

falling of the masses of the superstructure upon them in the time of the explosion. Even admitting these points without correction, the error would only amount to ·01 in a length of 228·14 ft. The difference in curvature between the south side and that of the north side is so exceedingly small, that we may readily believe that the increment which here is ·366, was intended to be the same quantity in both flanks. The existing differences are quite accounted for by the greater liability of the south side to disturbances, owing to the height of its stylobate above the rock." In Plate 5, Figs. 2 and 4, it may be perceived that the upper step of the Parthenon is composed simply of two arcs of circles: the first to suit the upper step of the east and west porticoes; the second to suit the upper step on the north and south return sides.

The Curved Lines of the Entablature.—Mr. Penrose, referring to the curved lines of the entablature of the Parthenon, makes the following important observations:—"These curves as they stand, at least in the fronts of the Parthenon, have certainly a curvature in a horizontal as well as in a vertical plane. The architrave of the east front is bowed inwards about ·1 foot, and the line of the under side of the corona of the cornice about twice that quantity, and in a comparatively regular manner, more resembling, however, a plane curve inclined to the horizon at about an angle of 45°, than a line of double curvature. During my examination of the Temple I met with many proofs that the curve, so far as its horizontal direction (*i.e.* the curvature on plan) is concerned, has resulted from accident, and formed no part of the original design. Of these proofs the following are the most satisfactory—The great stones forming the cornice at the angles of the Temple, which are upwards of eight feet long on each face, are rectangular on the plan, whereas if a horizontal curve in the cornice had been designed, there would have been a sensible difference from the right angle in so considerable a length." Other proofs are then given, but the passage is too long to quote in detail: Mr. Penrose clearly proves the curvature in the horizontal plane to be the result of the various concussions which have so seriously shaken the Parthenon, and which have destroyed the central part of the Temple, and which have caused the east and the west porticoes, as well as the inner porticoes, to fall slightly inwards, and the original vertical curve of the architrave to incline to the horizon at an angle of nearly 54° (See Plate 5, Fig. 5). It therefore follows that the original rise of the curve will be the diagonal line $a\ c = ·22$ in the architrave of the Parthenon, instead of the present vertical rise of $b\ c = ·17$. Thus in the architrave the ordinates, measured from the chord BB_1 to the arc of the curve, will correspond with the ordinates of the upper step, measured also from the chord BB_1, and the columns will all be exactly of the same height, which we find to be the case. In the west portico exactly the same result works out: the curved line of the architrave agrees with the curved line of the upper step. The observed facts, therefore, are found accurately to agree with the statement of Vitruvius, where he says:—

"The stylobate (namely the steps and other horizontal lines below the columns) ought not to be constructed upon the horizontal level, but should rise gradually from the end towards the centre, so as to have there a small addition,"* for he says—"if the line of the stylobate were perfectly horizontal it would appear like the bed of a channel." Again—"In placing the capitals upon the shafts of the columns they are not to be arranged so that the abaci may be in the same horizontal level, but must follow the direction of the upper members of the architrave, which will deviate from the straight line drawn from the extreme points in proportion to the addition given in the centre of the stylobate."

* "Stylobatam ita oportet exæquari, uti habeat per medium adjectionem per scamillos impares, si enim ad libellam dirigetur alveolatus oculo videbitur."

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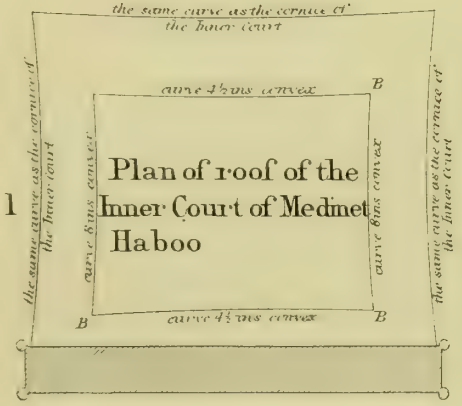
The curvature of the Horizontal Lines

Fig. 1


the same curve as the cornice of the Inner Court
curve 4½ ins convex
curve 6ins convex
curve 6ins convex
curve 4½ ins convex
the same curve as the cornice of the Inner Court
the same curve as the cornice of the Inner Court
B
B
B
B

Plan of roof of the Inner Court of Medinet Haboo

Fig. 2

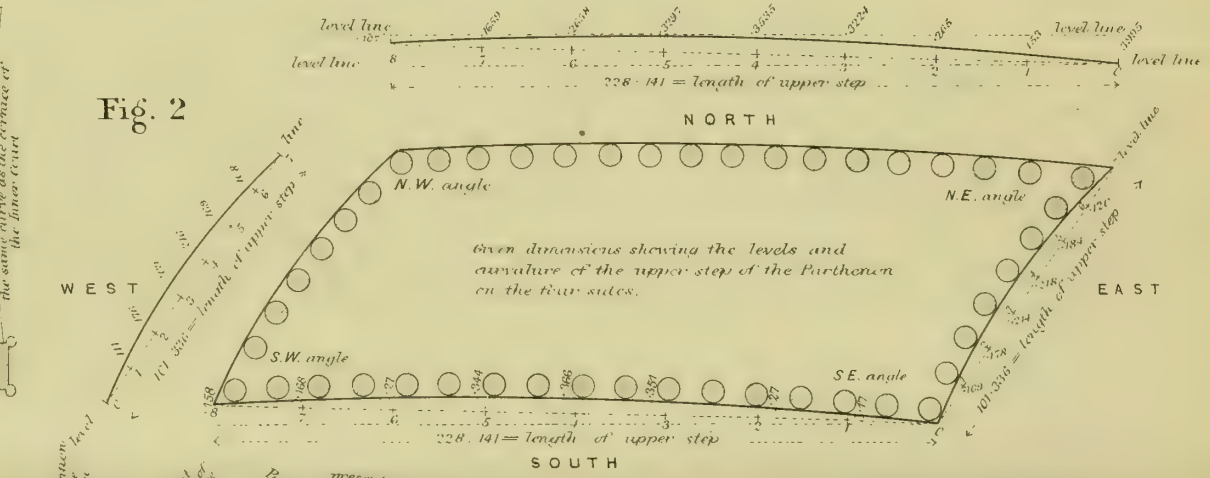
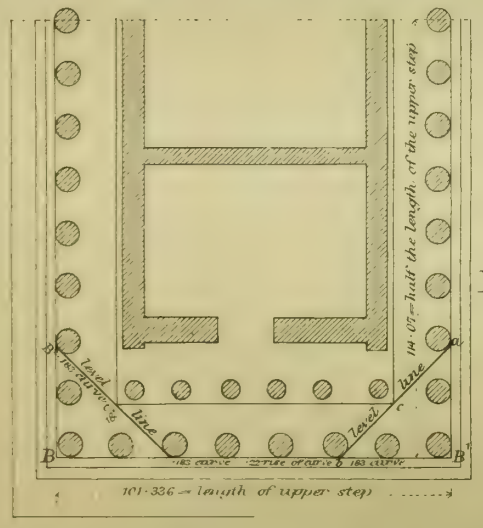


Fig. 3 Plan of the Parthenon



Figs. 5

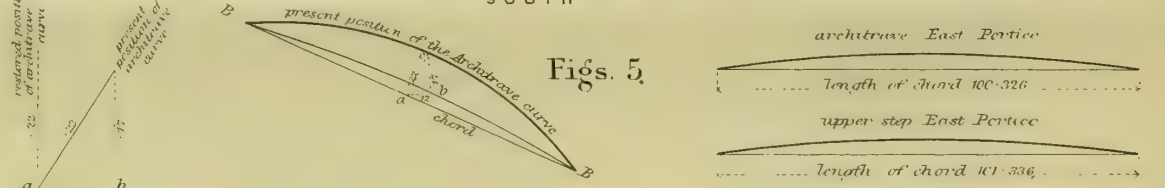
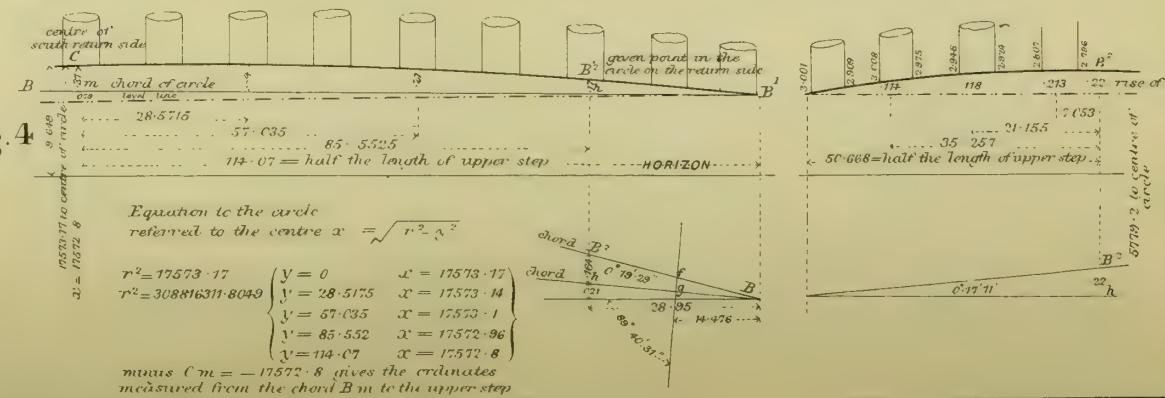


Fig. 4



It has frequently been observed in long horizontal straight lines, when viewed from certain positions, that they become to the eye apparently concave lines, and the Greeks seem to have observed the same fact when viewing the long horizontal lines of their temples, and to have endeavoured practically, as far as they were able, to rectify this apparent optical deception; but Vitruvius does not refer to any scientific optical laws for the correction of the horizontal curved lines; and if it is true that the curved lines of the architrave and cornice were executed similar to the upper step, which we find to have been the case, and that for the whole of the Parthenon only two distinct arcs of circles are required to be calculated for the execution of the whole of the horizontal curved lines, then it is clear that they could not have been separately calculated and corrected according to any optical law, and this appears to be confirmed by a passage in Philo, when referring to these lines he says:— "Therefore by the method of trial, by adding to the substance and reducing it, and by experiments in every possible way they (the ancients) made them regular to the eye and to the appearance of good symmetry." This passage implies that the correction of the lines was made experimentally, and the amount of curvature given in the centre of the upper step of the portico was selected, so that the lines should be pleasing to the eye. When Mr. Penrose compared the calculated arc of a circle with the measurements both for the upper step of the porticoes and of the return sides, he found no practical difference between the ordinates derived from measurement and those obtained by calculation, and these lines executed with such extreme precision must also have been calculated by the Greek architects from certain given quantities with the greatest care (Plate 5, Fig. 5).

Given Quantities.

BB_1 = 101·336 = chord line.
hB = 50·668 = y.
B_2h = 0·22 = rise of curve in the centre.
BB_2B_1 = three given points in the arc of the circle.
$x = \sqrt{r^2 - y^2}$ The equation to the circle when referred to the centre O.
r = 5779·42 ft. determined by calculation.
Oh = 5779·2 varying the values of y we obtain as many ordinates to the curves as may be required.

The Curvature of the Upper Step on the return side derived from the Upper Step of the Portico.—The curvature of the line of the upper step on the return sides both of the Parthenon and of the Temple of Theseus, appears to be derived from the calculated arc of the upper step of the porticoes. Thus the curve of the upper step of the porticoes being given, then set out upon the pavement, the level diagonal line $b\ B_2$, Plate 5, Fig. 3, let c be the level of the step at the angle of the inner portico, and B_2 will be the given third point in the curve of the upper step on the return side, and the rise of the curve in the centre $C\,m$, measured from the chord line BB_1, Fig. 4, is determined by calculation.

For the Parthenon $C\,m$ = 0·37 ft. by calculation. Mr. Penrose's measurement, 0·366 ft.
„ Theseium $C\,m$ = 0·103 „

Given Quantities.

B_1B = 228·141 chord line.
mB_1 = 114·07 = y.
B_2h = 0·164 = rise of curve above chord line BB_2.
0·185 = rise of curve above the level line.
$x = \sqrt{r^2 - y^2}$ equation to the circle.
r = 17573·17.

THE LEVELS.—In the case of the Parthenon the four angles of the upper step are not in the same horizontal plane, and there is a difference of level between the south-east and the south-west angles amounting to 0.154 ft., but the designs for the stylobates of the south-east and of the north-west angular designs, are also different, and the observed variations appear to arise from the fitting together of the stylobates of the two designs at the south-west angle, and are quite independent of the curvature of the lines.

This first part of the theory of design, only determines the true heights of the masses, and the convexity of the horizontal lines in the case of enclosed works, like the Greek temples, when the spectator, as well as the design, were under the control of the architect; but in some Greek designs, and in the Roman forum, the masses of the porticoes were executed in their original aliquot parts. Within these calculated masses, all the details have now to be worked out, and for this purpose we must consider separately the designing of the entablatures and of the columns, both very elaborate works of art, and this second part of the subject is applicable to all ancient designs, whether Greek or Roman. In all that relates to the given proportions, to the apparent magnitudes and to the points of sight, we have had the guidance both of Plato and Vitruvius, but there are no ancient references to the designing of the details, and the subject of the conic sections is not referred to by Vitruvius, or elsewhere, as applied to works of art; but we have the original drawings of the Greek architects engraved upon the marble capitals, the mouldings, the ornaments, and other details to guide us, and in many examples it is possible to trace these geometrical lines from the marble, and to recover the original given elements of the several curves. The calculations have hitherto been confined simply to the determination of a few lines and angles by plane trigonometry, and to the calculation of the arc of a circle passing through three given points, but in addition we shall now require, in the consideration of the details of the design, the power of calculating and of describing the arcs of the several conic sections, from certain given elements in each case, as these curves, the ellipse, the hyperbola, and the parabola, are all freely used in Greece, and possibly also in Egypt, in the designing of the columns and of the entablatures. The Doric and Ionic columns remaining in the Athenian Acropolis are not only beautiful works of art, but are also valuable existing fragments of the ancient geometry. The entablatures also are perspective designs carefully calculated, with the mouldings and ornaments mathematically traced, while the lights and shadows, as well as the colours, are all perspectively studied in the finished design. In the architectural parts of the design every branch of the ancient geometry is found to be applied, and all the calculations and forms are expressed in the marble with geometrical precision, then into this framework is introduced the celebrated works of sculpture and of painting, as well as the inscriptions, and the whole is harmonized by a judicious introduction of colours, applied both to the sculpture and to the architecture. The Parthenon as an intellectual composition is worthy of a place beside the great literary remains of the Greeks; it must remain like Homer—to be studied and admired, but not easily to be reproduced.

The Details of Ancient Architecture.

I have already trespassed so much upon your kindness, and upon the time allowed, that I must as briefly as possibly refer to the details of ancient architecture, and fortunately there are no new principles to be explained. We have already seen that the masses of the temples were perspectively designed and calculated, and this was also the case with the entablatures in Athens, and in Rome, they were designed as they were always intended to be seen, that is perspectively, and the only new feature

that has to be introduced, is the application of the *Conic Sections* to the outlining of the mouldings, the ornaments, the capitals, the Greek vases, and all the details of Greek art, and although we have no written work upon the Conic Sections earlier than Apollonius, B.C. 240, yet traces of these curves are found in all the marble remains of the Greek temples, and I have reason to believe also, in the outlines of some Egyptian cornices, and shafts of the columns, but this requires additional proof and study.

The fact of these curves being employed in ancient art, is not new, for Nicholson, in his "Dictionary of Art and Science," published in 1819, says, "Grecian mouldings are formed of some conic section as a portion of the ellipse or hyperbola;" and Mr. Gwilt observed the same fact with regard to the Doric capital, for he says, "the contour of the Doric capital will be found composed of the segments of curves formed by the section of a cone."

Mr. Penrose also states that the various sections through the Doric capitals, the curved soffits of the cornices, and the forms of the mouldings, were in the Athenian buildings invariably composed of the different arcs of the conic sections, and he observes also that "the capitals of the temple at Corinth (which were much earlier) seem also to be hyperbolic." But these general statements are not sufficient, and before we can retrace these curved lines, we must be able in every example to recover the original given elements, by means of which, each curve was anciently traced, and for this purpose, when in Athens in 1837, I obtained the true arc of every Athenian curve, either by tracing the section from the marble, or by tracing the outlines of the ornaments of the volutes, and of other spiral lines, by means of tracing paper laid upon the marble, and from these data, there is no difficulty in recovering the original given elements by means of which the curves were outlined by the Greek artists; this will be made clear as we proceed with the consideration of the details, and I will at once commence with the Egyptian ceilings, entablatures and ornaments.

The Egyptian Ornaments, Entablatures, &c.—The designs of the ceilings of Egyptian architecture were generally suggested by the ancient ideas of astronomy, and were either composed of the signs of the zodiac, or of stars fixed upon imaginary lines, as in the painted ceiling in the tomb of Rameses at Thebes. Sometimes the ceilings are divided into squares by black lines, and one star is painted in each square, or else they are divided into compartments by painted beams, and each compartment is filled with light stars on a blue ground, with an ornament around, painted in the alternate three colours—red, blue, and yellow—forming a cornice encircling the whole; and when we compare the Greek ceilings of the temple of Theseus, or of the Erechtheium, the same idea of the beams, with the light stars on a blue ground, is seen to exist; but in Greek architecture the parts are all carefully arranged and proportioned, so that, instead of a copy of the firmanent, the design of the ceiling with the stars is made a part of a perfect work of art; and in like manner a comparison between the entablatures of Egypt and of Greece points to Egypt for the original type of the Doric entablature; but the entablatures, as well as the columns, of Grecian architecture are so altered, that the original ideas are nearly lost, and the design of each order of architecture in Athens becomes a purely intellectual work, and is a geometrical combination of lines and of surfaces, rendered pleasing to the eye by a variety of mathematical forms in the mouldings and in the ornaments, and by a variety of lights and of shadows, and also, when required, by the additional relief of colours.

The agreement between the entablatures of Egypt and of Greece extends beyond the mere fact of the first idea of the design having an Egyptian origin, for we find, I believe, the same general principles of designing the entablatures perspectively, and of tracing the curves as the arcs of one or other of the conic sections, applicable equally to the Egyptian entablatures at Medinet Haboo,

B.C. 1200, as well as to the entablatures of the Parthenon, B.C. 430. In both designs the architects were guided by the laws of perspective and of geometry, and the same general principles of design that were laid down by the Egyptian architects passed onwards to Greece, and then to Rome, through a period of 1000 years, with only the slight variations caused by climate and by intellectual cultivation.

Besides the Egyptian ceilings and entablatures, I have given in my work ("The Geometry and Optics of Ancient Architecture") a few Egyptian coloured ornaments, selected principally from the tombs of the kings at Thebes, and leaving to others to identify, or not, with the Greek ornaments, each separate detail, yet speaking generally there appears to be some evidence, that in the early Egyptian painted offerings and ornaments, are to be found the types and models of the ornamental details of Greek architecture, and the change between the designing of the ornaments in Egypt and in Greece, is not greater than would naturally occur, when the mind sought to express its ideas with mathematical accuracy, and with perfect geometrical forms and proportions.

THE GREEK ENTABLATURES, MOULDINGS, AND ORNAMENTS.—In the designing of the Greek entablatures there are no corrections to be considered, but the whole entablature from the first, is perspectively proportioned, and arranged to suit the given point of sight; and this is the case in the designing of all the entablatures, whether in Athens or in Rome. The projections of the details of each entablature have been already given in Plate 2, as well as the whole apparent height of the entablature, measured in seconds upon the arc of a great circle in Plate 4. Then dividing this whole apparent height into some given number of aliquot parts, measured also in seconds, the apparent height of the architrave, of the frieze, and of the cornice will in each case, be a multiple of this given modulus. Again, by dividing the first modulus into a given number of apparent aliquot parts a second modulus is obtained, by which the apparent heights of all the details of the cornice, of the architrave, and of the frieze will be regulated, and the true lineal heights are then all determined by trigonometrical calculations.

In the proportioning of the Egyptian entablatures the whole apparent heights were first divided into three equal parts, two being given to the architrave, and one to the cornice; and in the proportioning of the Greek entablatures, the whole apparent height is generally divided into three apparently equal divisions of architrave, frieze, and cornice. The general heights and projections being perspectively determined, then the curved mouldings of the entablatures with their appropriate ornaments, remain still to be traced.

THE MOULDINGS, ORNAMENTS, AND VASES.—In Egypt we meet with scarcely any traces of architectural mouldings, and the ornaments are outlined and coloured upon flat surfaces; but in Greece the curved outlines of the ornaments, are generally traced upon curved surfaces, which become the mouldings of Greek architecture; and it is essential to give some idea of the profiles of the several classes of mouldings, and of the ornaments engraved upon them, as the entablature is composed of these several elements combined into a work of art.

From direct observation we find that the curved profiles of the mouldings can be reduced into the arcs of a few simple mathematical curves, and can then be classed according to the number of curves which combine to form the profile of the moulding. Thus (see Plate 6):—

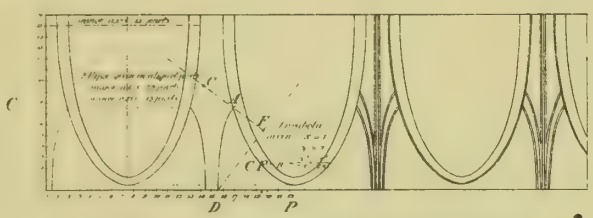
The first class of mouldings is formed of one mathematical curve. B.

The second class of mouldings is formed of two mathematical curves. B^1.

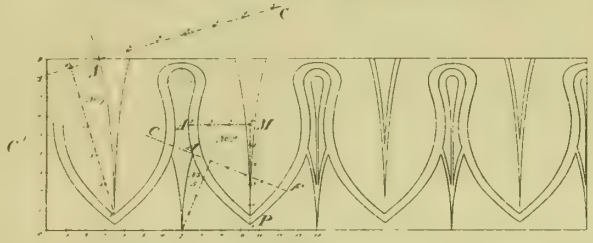
The third class of mouldings is formed of three or more mathematical curves. B^2.

Besides these three distinct classes of mouldings, the sections through the fasciæ are frequently

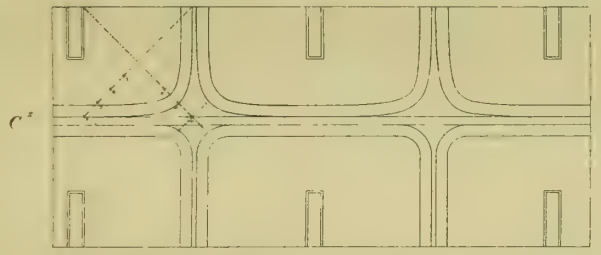
to face Page 121.



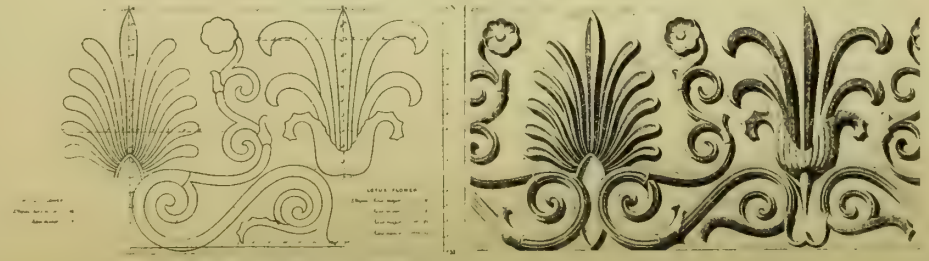
The Elliptical Ornament. *from the marble beam of the Propylaea*



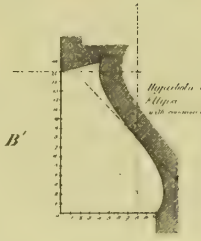
The Parabola Ornament. *from the Interior Cornice of the Propylaea*

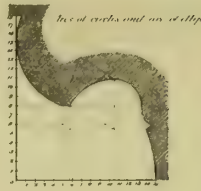


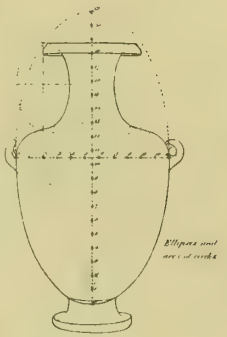
The Hyperbola Ornament. *from the Pediment Cornice of the Propylaea*

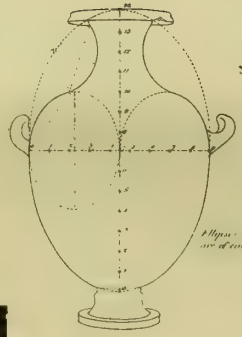


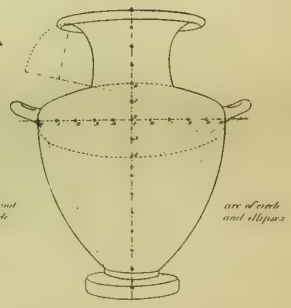
Lotus and Papyrus Ornament *from the Internal Cornice of the North Portico Erechtheum*







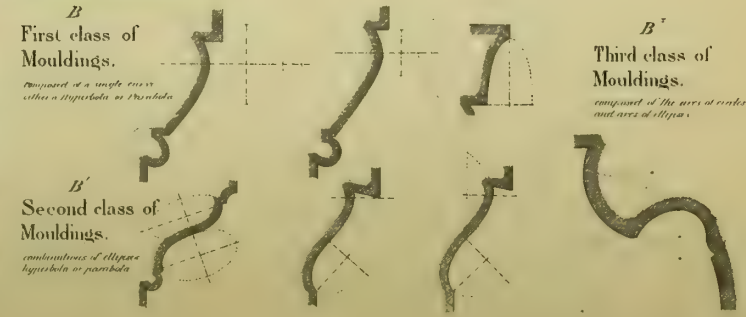




B
First class of Mouldings.
composed of a single curve either a Hyperbola or Parabola

B'
Second class of Mouldings.
combinations of Ellipses hyperbola or parabola

B''
Third class of Mouldings.
composed of the arcs of circles and arcs of ellipses



curved surfaces, the section being either elliptical or hyperbolic, and the sections through the soffits of the cornices are also the arcs of conic sections, either of the hyperbola, of the parabola, or of the ellipse; and on these several forms of mouldings the ornaments belonging to each class has now to be traced.

Each form of moulding has its appropriate ornament, which I have named according to the character of the conic section of which it is generally composed, as the elliptical, the parabola, or the hyperbola ornament (C C^1 C^2). The first ideas of the several forms of the Greek ornaments appear to be found in Egypt, but in Greece the ornaments are translated into the language of the geometry, and are mathematically traced upon the curved surfaces of the mouldings, and then relieved either by colours or by sculpture.

The designing of the ornaments becomes complex owing to the multplication of the curves one within another, but when a single outline is taken, the curve is found to be simply the arc of one or other of the conic sections, easily traced by the descriptive geometry from the given elements of the several curves.

Before considering the geometrical methods of outlining the curves composing the ornaments, the several curved surfaces forming the mouldings must be unfolded into plane surfaces, and the required ornament must then be traced upon the plane surface, which can be again exactly folded to the original curved form of the moulding: thus—The width of the plane, C, C^1, Plate 6, will correspond in dimension with the length of the profile of each moulding, B, B^1, when it is unfolded into a plane surface, and this straight line is always divided into some given number of aliquot parts, which will regulate the dimensions of the required elements of the conic sections composing the ornament.

The three examples selected to illustrate the designing of the ornaments are traced from the ceiling of the Propylæa, and are given in figures C C^1 C^2, but all the mouldings with the ornaments engraved upon them are similarly designed, and there is not an example of a curved line in Athens that is not mathematically traced.

The Lotus and Papyrus Ornament.—The ornament that I have called the Lotus and Papyrus ornament, appears at first sight to have been traced without any reference to the guiding lines of the conic sections, but when examined this is found not to be the case. Thus taking for an example the sculptured ornament traced from the Erechtheium, Plate 6, we find the papyrus flower to have been described within a perfect semi-ellipse, with axis major = 16, and axis minor = 9. And the lotus flower to have been described within two semi-ellipses: thus—1st, with axis major = 18, and axis minor = 11; 2nd, with axis major = 11, and axis minor = 4.

These ellipses were proportioned and arranged according to a given modulus, the same as in other examples; then the separate flowers were outlined and engraved on the smooth surface of the marble within these given curved lines, and afterwards relieved by being sculptured in detail. The Erechtheium never having been quite finished, this ornament is seen in progress, some portions being finished, and other parts merely executed in the first masses, and the same gradual steps are observed from the smooth surface of the work, simply outlined, to the finished sculptured ornament, the same as is seen in the ornaments executed on the 1st and 2nd classes of the mouldings.

The designing of the above ornament appears to agree very closely with the method of designing the Greek vases, of which I have given three examples, Plate 6, selected from the British Museum, and all these designs appear to be combinations of ellipses and arcs of circles, the axis major and the axis minor being given in every case in aliquot parts, and although no two examples are

alike, yet the method of designing the vases is the same in all, and the ornaments that are geometrically traced upon the mouldings of the temples, are simply sketched upon the vases.

I give these vases to show that the Greek methods of designing the ornaments were not confined to the larger works of art, but were applied also to their manufactured articles.

The Columns.—Without entering into a detailed comparison between the Egyptian offerings and columns, I think we may perceive that the first ideas of the Egyptian columns were derived from the artistically arranged offerings that are painted in the tombs, and on the walls of the temples, and that the Grecian Doric columns and entablatures were suggested by those earlier Egyptian designs (see Plate 7), shewing the origin of the Egyptian columns with the accompanying sketches; but the Egyptian architects were guided in the design of the columns by the laws of proportion, and by a knowledge of geometry, and between the designs of the Egyptian and of the Greek columns we shall meet with many points of very close resemblance, quite sufficient to prove that the first ideas of the Doric columns and the first principles of Greek art were both derived from Egypt. But in Greece we lose all trace of nature in the designs, and the columns, as well as the ornaments, are purely intellectual works of geometry, dependent for their beauty upon accurate proportions, upon true mathematical curves, upon a careful study of light and shadow, as well as colour, and, lastly upon great precision in the execution of every detail.

When considering the designs of the Greek porticoes we found an established canon of proportion, which was not changed except for some special reasons, and the same observation will apply to the Greek columns in Athens; the architects appear as a rule to have adopted a certain canon of proportion, both for the Doric and for the Ionic columns, thus—

$$\text{In the Doric order the width of the abacus} = \frac{\text{height of column.}}{5}$$

This is the case in the Parthenon, in the Temple of Theseus, in the Propylæa, north wing, and in the Temple of Apollo at Phigalia.

$$\text{In the Ionic order the width of the abacus} = \frac{\text{height of column.}}{8}$$

This is the case in the three examples of the Erechtheium, and in the Ionic temple of the Ilissus and at Priene.

The first masses of the columns being arranged, then the width of the abacus is always divided into some given number of aliquot parts, as 14, 15, 16, &c., and one of these parts being taken as a modulus, then the upper and lower diameters of the columns, and in the Ionic order the height and width of the capital and of the base are made multiples of this modulus. Why certain special numbers were selected for dividing the abacus into aliquot parts no satisfactory reason can be offered, and it appears to have depended upon the judgment of the architect; but all the details of the columns, as well as of the entablatures and ornaments, were invariably proportioned in aliquot parts, and it will be found to simplify the calculations required for the curves by the absence of all fractional quantities, and it is more simple than figuring in feet and decimal parts.

To enter minutely into the designing of the columns would involve too much detail, but I will refer briefly to the method of designing the Ionic volute, and to the Doric capital.

The Doric Capital.—This is a combination of a few simple parts, and the curvilinear profile is composed of the arcs of two hyperbolas; the one convex to the eye, and the other concave. Besides these two curves forming the profile of the capital, there is also the vertical section through

The Origin and Proportions of the Egyptian Columns

Fig 1 The Papyrus growing naturally.

Fig. 2

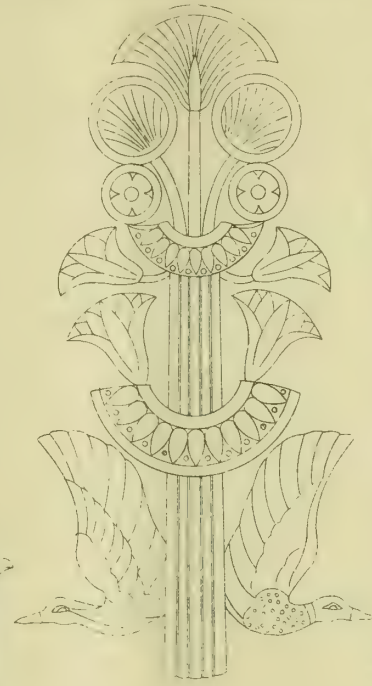
Papyrus Offering
in the Tomb of Rameses 2nd B C 1340

section of the stem.

Column
Medinet Habou

The plan of this column is similar to that of the column at the Memnonium (fig 5) and shows three lines dividing it into an equilateral triangle

Fig 3 Papyrus Offering in the Tomb of Rameses II *(B C 1340)*

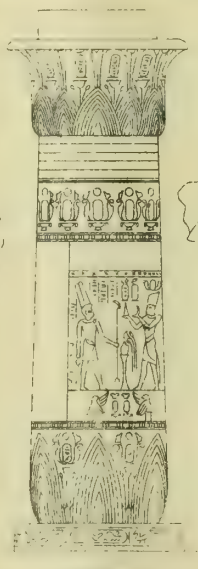


section of the stem

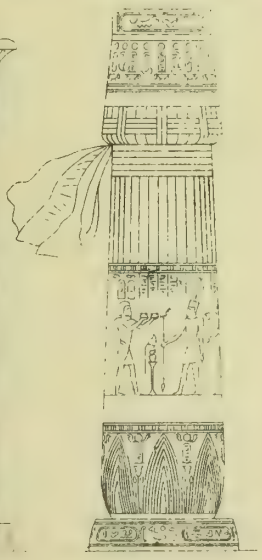
Column at Old Kourneh B. C 1340

Fig. 5. Egyptian Columns.

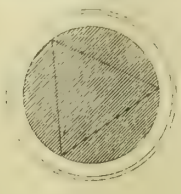
Memnonium Thebes. B.C. 1300.



Memnonium B C 1220



Medinet Habou B C 1220.



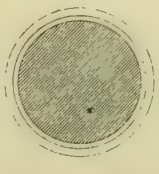


Fig 4 Rock Tomb at Beni Hassan *(B C 2000)*

Photo Lith[d] by C F Kell London E C

John Pollard del

to face Page 123.

Section of a spiral shell, the Ammonite, Fig 1.

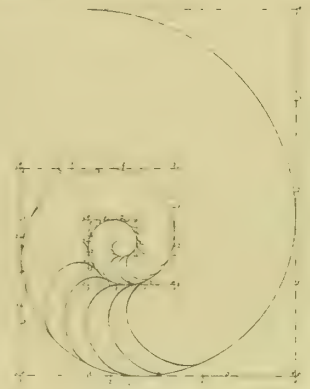
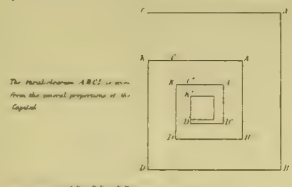
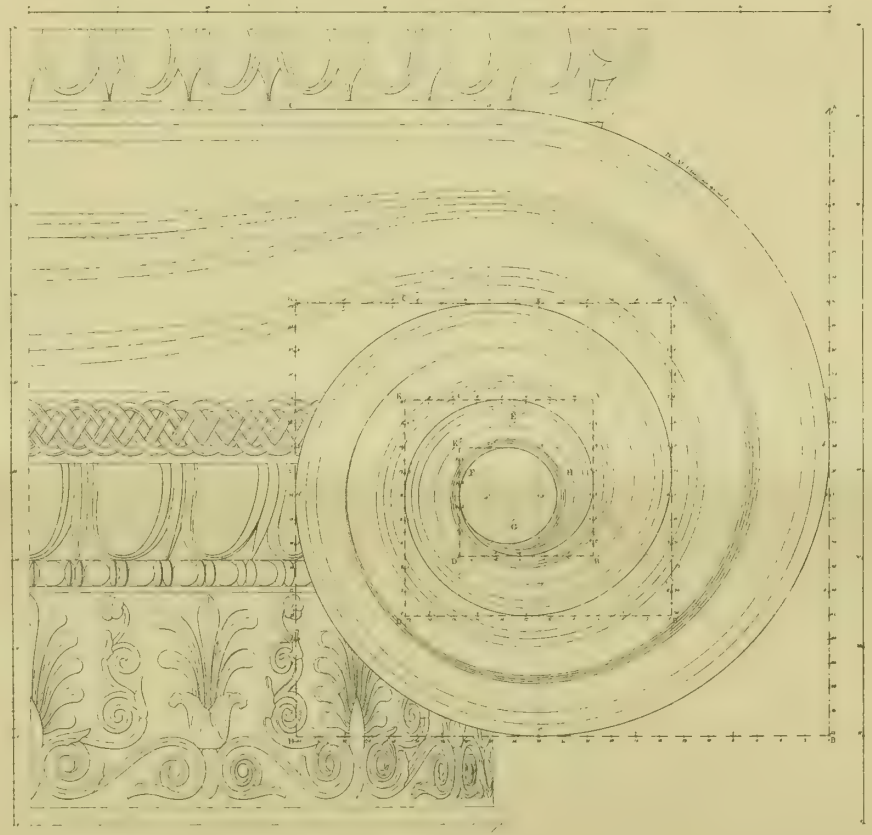


Fig 1

Fig 2 The rectangular spiral line of the N°1 Spiral



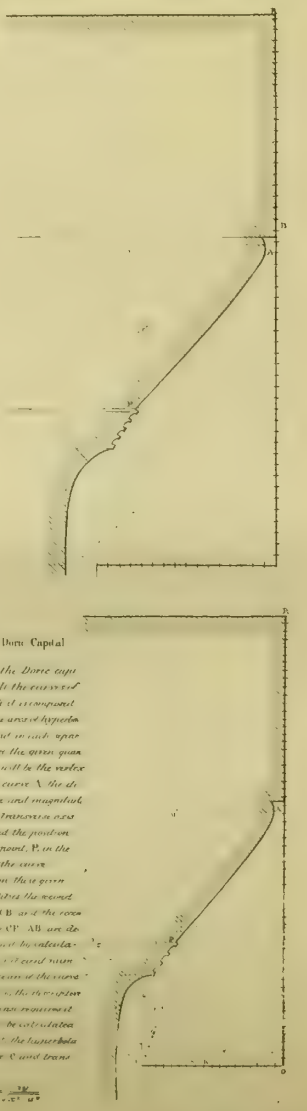
The Volute of the Ionic Column of the Erechtheium *Keith Pinxt*



The Doric Capital

In the Doric capital with the curves of which it corresponds on the annexed hyperbola has not in each upon ole are the given quantities will be the vertex of the curve N the direction and magnitude of the transverse axis AV and the position of one point P in the arc of the curve

From these given quantities the second axis CB and the eccentricity CF AB are determined by calculation, and then a sufficient number of points on each of the curves can be determined by the construction described and the rectangular co-ordinates of these points measured on the axis AV



The Method of Describing the Volute of the Ionic Capital

As proposed by Mr John Robinson

The Parallelograms A'B'C'D' ABCD, A'B'C'D' being given in position

In the given parallelogram, ABDC derived from the general given proportions of the capital, let the length of the rectangular boundary lines, AB, BD, DK, of the first revolution of the spiral line diminish in some given ratio; then upon the line, AB, construct the right-angled triangle, AEB, and upon the line, DK, construct the right-angled triangle DGK. The points E and G, must always be in the same perpendicular line, consequently $\frac{AB - DK}{2}$ is always equal to the side BD. Then construct the square EIGH, and bisect each side of the square in the points 1, 2, 3, 4, and from each of these points of bisection as centres, and with radii equal to 1a, 2b, 3c, 4d, describe the 4 arcs of the circle combining to form the first revolution of the spiral line a, b, c, d, e.

In the second parallelogram, A B D G, let the side, A B equal $\frac{AB}{2}$ and let the ratio of diminution of the boundary lines, A B D K, of the second revolution of the spiral line correspond with that of the first revolution, and let $\frac{EA}{2}$ be made equal to $\frac{BE + AB}{4}$ and in the third parallelogram, A B D G, let the side, A B be made equal to $\frac{AB}{4}$ and let the ratio of diminution of the boundary lines, A B D K, of the third revolution correspond with those of the first and second revolutions. Then repeating within the boundary lines of the second and the third revolutions the same operation for the construction of the arcs of the circles, the three revolutions of the No 1 guiding spiral line of the volute are described, and the other spiral lines of the volute are regulated by the No 1 guiding spiral line.

$$c = \frac{a}{2} \cdot \sqrt{m^2 - 1} - a \quad \text{and} \quad CB = b = \frac{2W}{\sqrt{e^2 - 1}}$$

the centre of the flute, which is also the arc of an hyperbola. In each of these three curves the given quantities are the vertex of the curve, the direction and magnitude of the transverse axis, and the position of one point in the arc of the curve. From these given quantities the other elements are found, and the outline of the arc of each curve is described geometrically, as shown in Plate 8.

THE CURVED SPIRAL LINE OF THE IONIC VOLUTE.—In the case of the Ionic capitals it is clearly stated by Vitruvius that the spiral lines are composed of the arcs of circles, and the tracings taken from the existing Greek volutes in Athens show this to be the case.

The method which Mr. John Robinson has suggested for describing these lines, and which I believe to be correct, is given in detail in Plate 8, and it will be perceived that each revolution of the spiral line is described from four centres, and one complete spiral line, with three revolutions, require to be described from twelve centres. The Ionic capital is more complex in design than any other detail of Greek architecture, but the principal feature of the capital is the *Spiral Volute*, and to this subject alone I will direct your attention. The idea of the spiral line, as of other curved lines, is suggested by many forms in nature. Thus taking for an example the reduced section of a spiral shell, the ammonite (Plate 8) traced full size from nature, we find that the curved spiral can be bounded by a rectangular spiral line, and that these lines, in the case of the shell, have a certain relation one to another of 4 : 3. Also each revolution of the curved spiral can be enclosed within a given parallelogram, derived from the rectangular spiral line, and the same is the case with the Ionic Volute—first, a rectangular spiral line was set out by the Greeks, and from this they obtained, given in position and in dimensions, three parallelograms ABDC, A′B′D′C′, A″B″D″C″, one within another (see Fig. 2), and then within each parallelogram one revolution of the curved spiral line is described in a uniform manner. Taking as an example the No. 1 spiral line of the volute of the Propylæa (Plate 6), then,

The parallelogram ABDC, containing the first revolution of the
No. 1 spiral line, the ratio of the sides, DB : AB are as 6 : 7

The parallelogram A′B′D′C′, containing the second revolution of the
No. 1 spiral line, the ratio of the sides, D′B′ : A′B′ are as 6 : 7

The parallelogram A″B″D″C, containing the third revolution of the
No. 1 spiral line, the ratio of the sides, D″B″ : A″B″ are as 6 : 7

These are simply the observed facts, but beyond these observed facts there is still required some law for fixing in position and in dimension these several parallelograms one within another, and for this law I am indebted to the careful study of the subject by Mr. John Robinson, who discovered the relationship between the several rectangular lines containing the No. 1 spiral line.

The Greek columns, like all the other details, are pure works of the descriptive geometry executed with wonderful precision in marble, but sufficient has been said to explain the character of the curves, and the methods of applying the geometry to the forms of art. In conclusion there is only one more subject to be noticed, and that is quite independent of the geometry. Vitruvius refers to it under the head of *Scenography*, that is a finished coloured drawing of the whole design, shewing, as he says, "the front and a receding side, properly shadowed, the lines being drawn to their proper vanishing points." This was evidently a perspective view of the whole design, taken from the angular point of view, and shewing the sculpture and the painting, as well as the architecture, all combined together in the finished drawing. These perspective drawings have still to be restored before we can form a true idea of the real appearance either of the Parthenon, or of the vestibules of the Propylæa, as these works appeared to the spectators, when they were first executed, or as they

appeared five hundred years later in the time of Pausanias, or of Plutarch, who refers to them in the following passage :—" Even now they retain the strength and freshness of a modern building, a bloom is diffused over them which preserves their aspect untarnished by time, as if they were animated with a spirit of perpetual youth and unfading elegance." It would however require the artist feeling of a Raphael or of a Claude to reproduce copies of these original drawings of the Greek artists, but the materials exist in the remains of the sculpture, of the painting and of the architecture, and in the position of the Acropolis itself in the plane of Athens.

It would be possible to compare the laws of proportion, of colour, and of form, that are traced in some branches of physical science, with the ideas which the Greeks applied to art, and when we analyze their works we find them to be composed of simple parts : a few elementary proportions, four or five distinct forms of curved lines, and a few primitive colours ; and with these simple materials, combined perspectively, works of art were produced that are quite worthy of a place along with the Greek works of geometry and of literature. The arts and sciences were truly united in the Greek mind, and it was this intellectual and scientific character that rendered the stream of ancient art, which commenced in Egypt and flowed onward with varying degrees of strength and depth, through the best Greek and Roman periods, so different to that of any other country in the world. The arts were then united with the geometry, and with the highest intellectual culture, whereas, we find in India, in Assyria, and, in the middle ages, in Europe, that architecture everywhere attained a certain degree of excellence, suited to the climate and to the wants of society, and then became stationary and decayed, for without the geometry it could not advance beyond the first elementary state, and there was no power to refine and perfect the first ideas. In the investigation of the works of nature, either with the telescope or with the microscope, the fact that nature is always working by the laws of geometry, both upon the largest and upon the smallest scale, is continually made apparent to us, and it is this perfection and accuracy of design and execution, that we admire in all the works of nature, that true art should strive to attain, by being guided by the same mathematical laws and principles. It was not until the European mind, in the fifteenth century, was linked again to the ancient stream of geometry and philosophy, that a real advance was made in any branch of modern science, and probably no real progress will be made in architecture until we can completely recover and freely use the accumulated knowledge of the ancient world in all that relates to the science of art, and make it a basis and a starting point. But there is no reason why the designs of modern Europe should be in any degree inferior, either in conception or in execution, to those of the best ages of the ancient world ; or why, with the civilization of the nineteenth century, we should impress upon our public monuments the marks of the twelfth, or of any other century that has preceded us : but I must not trespass longer upon your time. I have endeavoured very imperfectly to interpret from the marble some of the Greek ideas of designing, and fortunately these present no real difficulties when once the position of the point of sight is determined, then calculating the design backwards all the original apparent proportions re-appear ; and with regard to the details and ornaments, by merely tracing them from the marble, we recover the original mathematical lines that were engraved by the artists upon the mouldings and other forms ; and this is all that has been attempted, and imperfectly accomplished.

DISCUSSION.

THE PRESIDENT.—We have now to proceed to the discussion of a Paper of no small erudition – of no small value and interest. With reference to it, one thing has occurred to me—that is, the great privileges the best Greek architects seem to have had of placing their buildings in the point of view from which they desired them to be seen. That is strange to us who have to plan our buildings without much reference to the surroundings; at the same time I imagine any modern architect who bestows labour, thought and care upon the work he produces, would, if he could command the surroundings, have his work seen to the best possible advantage and effect. That the architects of the Parthenon seem to have secured. They studied refinement of curvature, distance and treatment, all having reference to the point from which their buildings were viewed. Whether they would have adapted the particular treatment described if seen from other points must be matter of conjecture; that calculated from the points from which their buildings were viewed they were entirely successful, the world's admiration of that great work—the Parthenon—is a tolerably convincing proof. But I leave to others the task of proving the value of Mr. Pennethorne's labours.

FRANCIS C. PENROSE, M.A., *Past Vice-President.*—I am in common with other members of the Institute so much indebted to Mr. Pennethorne, firstly for his discovery of the optical refinements of the Greeks, and secondly for his having brought the matter before us elucidated in so complete a manner and with such evidence of classical and mathematical research, that I feel sorry to feel obliged to dissent from some of his conclusions; but I will give myself the pleasure of mentioning several points in which I recognise complete agreement. In the first rank in this category I will place the evidence given, that the Greeks preferred placing their buildings so as to offer angular views, which is very contrary to the usual modern practice and very much more effective; then the statements relating to the adaptation of the proportions to the purpose of the building. As respects the principle of adaptation of the proportions to the site I give a general agreement, but I do not carry it so far as Mr. Pennethorne, and I dissent from the laws which he propounds for the final adjustment of the measurements so as to give commensurate ratios to the apparent angular quantities when seen from certain arbitrary points of view, although I am not prepared to say that the apparent proportions from such points of view were not considered and provided for, because the effects of foreshortening cannot be and are not ignored by any careful architect; but I believe that Mr. Pennethorne's method, so far as it claims to be the rule which fixed the accurate proportions, whilst open to serious objection *a priori*, does not afford on the whole an adequate approximation to the measurements, although it seems to catch some lucky coincidences, and I think I shall be able to show that Mr. Lloyd's rule is both a more desirable one in itself and gives far closer accordance with the measurements. But I have several more points to speak of in complete harmony with Mr. Pennethorne. He has established most completely the use of the conic sections by the Greek architects, not only in the case of the profiles of the principal mouldings but also the contours of many of the ornaments. He has gone much further into this subject, I think, than has been done before; although there have not been wanting instances already investigated, and I may cite the complete hyperbolic elements in the case of the *entasis* of several columns and of the echinus also, and of the pediment coronas of the Parthenon and Propylæa, and the parabolic elements of those

of the Theseium and Erechtheium in the "Principles of Athenian Architecture." The point must, however, now be considered as set entirely to rest, and the Greek architects of the time of Pericles must be credited with a practical acquaintance and love of these important curves. The method shown by Mr. Pennethorne for the description of the Ionic volute needs no praise from me: it is most complete.

With respect to what has been said on the subject of the horizontal curved lines, on one small point of detail I offer a criticism. Mr. Pennethorne has argued that, because it has been shown that the lines of the entablature have by certain concussions been forced out of their original vertical plane into a plane at about 45° from the horizon, therefore the original increment of curvature, or elevation above the straight line joining the angles, was originally greater than it is now, in the ratio of the diagonal of a square to the side, which would make it the same in the entablature as it is below in the step. To this I answer that this reasoning would be sound if in the case of the architrave the angle of disturbance had taken place about the straight line joining the extremities of the architrave; but it evidently was not so. It must be reckoned from the bases of the columns, and the difference in height due to the movement of 0·171 at the height of 34·25 would be absolutely insensible.

My chief point of criticism, however, is on the determination of the proportions in the manner proposed from certain assumed points of view. I object to this method *a priori* on this ground, that supposing a value (and which we must suppose) in accurate proportions, if they have been adjusted into their intended amounts from some given point of view, any change of place must seriously modify them, and I think that the passages which have been so valuably adduced from the ancient writers on the subject of apparent proportions can be quite explained as meaning the necessity of the general adaptation of the upper objects to their situation. Plato is undoubtedly thinking primarily of sculpture. It seems to me that in architecture instead of *apparent* there is more advantage in *true* proportions skilfully selected, which leave to the educated eye of the cultivated spectator the task of recognising the real relations of the different constituent parts. I grant, however, that this *a priori* reasoning would fail if there was a sufficient body of proof from the coincidence of calculations by Mr. Pennethorne's rule with actual dimensions, but in this proof mere general accordance will not suffice; it must be absolute to be convincing. What do we find? I have taken Mr. Pennethorne's elements and performed the calculations. I have used all the given horizontal distances and the same height below the upper step, and with these have taken as a given quantity Mr. Pennethorne's value of the height of the column; and I obtain for the other parts of the design as follows:—

	By Calculation, from the south-eastern point of view.	As Measured.
(*a*) The marble steps (including the smaller and variable lowest step) subtending one-sixth of the apparent angular measure of the column	5·680	5·678
(*b*) Entablature, two-sixths of the same	11·003	11·096
(*c*) Pediment, same apparent subtense as the entablature	12·36.	12·454, that is to say when the cymatium is omitted, which is an integral part of the pediment with this added, it is 13·534.

I admit that in the first two instances these answer their requirements in a sufficiently plausible

manner to make it quite worth while to try the method by other cases, and the coincidence of the steps is very happy, produced as it is by the variable substep, which at the south-eastern corner is much thinner than elsewhere; but let us try the method from Mr. Pennethorne's other point of view at the north-west, which, as it offered the first great near view of the temple, is at least entitled to as much consideration as the south-eastern view. From this point of view, with Mr. Pennethorne's data and method, I obtain :—

	By Calculation.	As Measured.
The marble steps, including as before the variable step	6·019	6·227
Entablature	10·976	11·096
Pediment	12·738	12·454 or 13·534 if the cymatium be included.

Mr. Pennethorne, amongst other cases in his book, gives the vertical and horizontal measures for a point of view from which he claims to have solved the apparent proportions of the western portico of the Propylæa. These I have adopted, excepting that I have used for the height of the columns 28·962 feet, which is their measure when deprived of the increment of curvature which Mr. Pennethorne includes; but I think it should be excluded. If however we accept it, the discrepancy will only be reduced by 0·074, and will still remain quite unacceptable. In the case of this portico Mr. Pennethorne claims an *apparently* proportional agreement between the column and the entablature and pediment combined, in the ratio of 9 to 5. I obtain by calculation from his data a quantity for the latter of 17·877 against 18·640 measured.

I consider that I am justified from the cases of the north-western angle of the Parthenon and that from the Propylæa in refusing my adhesion to the proposed scheme as failing in sufficiently accurate correspondence; and I am confirmed in this opinion by finding that Mr. Watkiss Lloyd's method, which appears both more desirable and manageable in itself, as giving far more scope and freedom to the architect, is also in better correspondence with the measurements. Moreover he did not arrive at his scheme without testing it on many examples, and he believes it to be generally true. In a Paper read to the Institute in February, 1877, I adduced a great many instances showing its extreme accordance with the measurements of the Parthenon, and I will take this opportunity of applying it to those proportions of the Parthenon and Propylæa which we have just examined. The method briefly is this: Such proportions only are admissible as $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$, &c., $\frac{9}{10}$, &c., which are applicable to all important designs in combination with another parallel system which may vary so as to be peculiar to particular buildings, the keynote of which is generally found in the ratio of the front and flank of the temple. This in the Parthenon is 4 : 9, and the terms in sequence with it are, $\frac{1}{0}$, $\frac{2}{7}$, $\frac{3}{8}$, $\frac{4}{9}$, $\frac{5}{10}$, $\frac{6}{11}$, $\frac{7}{12}$, $\frac{8}{13}$, $\frac{9}{14}$, &c. The standard proportions are usually found in the latter series, which is again also used in proportioning the details, but the principal divisions of height are found in the first, namely, that in which the numerator and denominator differ by one. Thus in the Parthenon the height to the apex, a primary proportion, is $\frac{2}{7}$ of the length of the flank, or what is the same thing and also one of the series $\frac{9}{14}$ of the breadth of the front. In the divisions of the height the measurement of the solids taken together is $\frac{9}{10}$ths of that of the voids: that is, the pediment entablature and steps are to the column as 9 to 10, and on the flank the measurement of the solids, consisting of the entablature and steps, is half the column. The quantity thus obtained

for the entablature and steps is then subdivided by means of a ratio out of the second series, namely, $\frac{6}{11}$.

	As Calculated.	As Measured, omitting increment of curvature.
Total height $= \frac{9}{14}$ front measured on upper step ...	65·147	65·055
The column which is as 10 : 9 to the solids $= \frac{10}{19}$ total height	34·287	34·253
The sum of the solids $\frac{9}{19}$ total height	30·860	30·802
The column *already settled* $\frac{2}{3}$ height on flank	34·287	34·253
The entablature and step $= \frac{1}{3}$ height on flank, *i.e.*, half the column	17·148	17·215
The entablature $\frac{11}{17}$ of the last, *i. e.* $\frac{1}{6}$ of the step ...	11·092	11·096
The step $\frac{6}{11}$ entablature	6·051	6·078 at the N.E. angle.

In the case of the Propylæa I have simply tested the ratio of the voids and solids of the west portico. Assuming that it was adjusted for the usual number of *three* steps as its stylobate and using the uncorrected height of column 28·962, and entablature and pediment amounting together to 18·641, we have a ratio of 28·962 to 21·651, which is very nearly 4 to 3. Had the latter been 21·722 the ratio would have been exact.

Although I have felt called upon to combat some of the theories brought forward in Mr. Pennethorne's most interesting Paper and book, I do so with the greatest respect and gratitude for the addition he has made to the architect's library, and a general acceptance of the value of his doctrine of apparent proportions; but, as I have plainly indicated, not to the extent of agreeing that the actual dimensions of the Greek temples were so finally adjusted.

Mr. W. Watkiss Lloyd.—In common with Mr. Penrose, and I doubt not with many others, I cannot but feel that the attention which Mr. Pennethorne has given to this subject is entitled to our highest admiration. In fact, when I regard the display of thought, ingenuity and care in the drawings and lithographs which he has prepared, to say nothing of the amount of labour entailed by the preparation and publication of the letterpress to which they form the illustrations, I admit that it is somewhat ungracious, as well as perhaps presumptuous, to make even a demonstration tending to discredit a system which is the outcome of so much disinterested application and study. Moreover, I am speaking without having had the advantage of studying Mr. Pennethorne's book at large; and my criticisms are only founded on the Paper which gives a general summary of its processes and purport. We have heard, however, from Mr. Penrose certain results of an exact comparison of the process set forth in it with that which I am prepared to advocate. I am familiar with the eminent writers referred to by Mr. Pennethorne as his authorities, and have taken the opportunity of refreshing my memory with regard to the testimony which they may yield to his system. The chapter in Vitruvius certainly admits of an interpretation that is suggestive of the process which Mr. Pennethorne has applied, but his expressions in these passages must be taken along with their recurrence in some others, and then with the parallel observations of other authors. As far as I make out, those authors chiefly refer to adjustments which have no bearing on the leading proportions of architectural members, but are requisite for correcting certain optical illusions in works of art, of mimetic arts principally, and then with the same restriction also to architecture. Plato refers particularly to colossal sculpture. There were already in his day

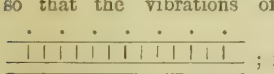
in Greece a vast number of colossal statues, and artists had found by experience that the heads would appear too small unless they were exaggerated. There is a passage, however, which Mr. Pennethorne has not referred to, in a Greek treatise on Optics (it is quoted in the notes to Schneider's Vitruvius) which has direct reference to architecture. The author not only speaks of *entasis* of the columns as required to curtail any appearance of a reversed curve, but also of the necessity to execute as an oblong what is desirable to produce the effect of a square—an occasion which probably would occur in the case of windows at great height. Then again a form which was intended to appear to the spectator as a true circle was carried out as an ellipse. Such is one class of adjustments of which other cases are, I believe, perfectly familiar to architects at the present day, and constantly considered by them in practice. Then Vitruvius speaks of various additions and diminutions which have to be applied by the architect—*temperatures*, as he calls them—which are not familiar in modern architecture; but it was the great service of Mr. Pennethorne to have detected these as a reality in the ancient. These are the moderate alterations of the nature of curvature for the purpose of correcting an optical distortion, but are too slight to have any concern with the determination of leading proportions. It further appears, by comparison of other passages of the same author, that what he understands by "additions and diminutions" to a primary design—which are of such extent as to affect it seriously—does not apply to what we properly call proportion of architecture, but to enforced modifications of an original scheme of distribution. He gives as an example how, when a building is in a confined position or in the vicinity of other high buildings, the architect is bothered by interference with his light, and it becomes necessary for him to vary his design from the set model and precedent that Vitruvius always assumes; he must at any rate put his light where light can be admitted, and do his best by the additions or reductions in question to get symmetrical arrangement. But I think it will be seen that none of these cases enable us to quote the testimony of ancient authors as justifying the principle which Mr. Pennethorne insists upon. Doubtless it is in accordance with this testimony, and stands to reason, that ancient architects, in designing a building of such height as the Parthenon, would take into consideration that the surmounting pediment must have a sufficient height to ensure that it should not, in consequence of its position, have a less important effect than they intended. It is one of the puzzles of optics, never satisfactorily explained, how it is the eye and the judgment between them do not, in some circumstances, make the allowances for distance which in others they make most competently. Such, however, is certainly the case; but an adjustment which would meet it sufficiently may be one of any number, and thus the question is left open as to what the exact dimensions adopted in any particular case should be. Mr. Pennethorne's theory propounds with perfect fairness a rule according to which a point of sight was adopted that would take in the entire building, and he proceeds to calculate from that what heights of pediment and of entablature would from this point subtend equal visual angles. That is a very reasonable theory to be entertained and put to proof, and it may even be allowed to furnish as applied a plausible solution of the particular problem; but we have to consider that the problem of deciding the proportions of a building does not apply only to relative heights in elevation (and even these, as Mr. Penrose has shown, are scarcely met by the theory), but also to the general height, length and breadth of the structure, as well exteriorly as to those of the interior apartments. My own contention is that all these were arranged systematically in accordance with simple proportions and with that delicacy which was in favour with the Athenians of the age of Pericles. I do not find that the theory of Mr. Pennethorne either considers or provides for these cases, whereas the principle which I worked out years ago, and which Mr. Penrose has already referred to, does satisfactorily apply to plan, section and elevation. I feel almost inclined to expostulate with Mr. Penrose for the particular form in which he has represented instances of

proportion, which I rely on by somewhat awkward looking fractions. To those who may not be quite so familiar as he is with mathematical analysis, they are certainly by no means inviting as thus reduced. I should, however, like, if you will allow me, without detaining you very long, to read from the dimensions I had engraved in 1863 some simple results which are brought out by the system I set forth. My own theory, in brief, is this. The architect had first to consider the general proportions of the apartments which he required. When the purpose was to house and display a statue, a long apartment was necessary, and with this a smaller one as a treasury—the sacristy of antiquity —was associated. The general plan of Greek Temples is so far much the same in most cases, and so was the distribution into porticoes and peristyles; but it remained for the architect to distribute the settled members of the elevation according to his taste and feeling. What I believe can be proved is: that this was effected by skilful selection of a scheme of proportions applied with originality and the nicest accuracy. I have traced such a system consistently varied through all the best Greek buildings of which we have sufficiently accurate dimensions, and I find they come out with mathematical exactness. In the case of the Parthenon, the system of proportion applied scarcely comprises as many as ten ratios, and all of low numbers; even of these the chief responsibility is thrown upon three, which are variously applied to divisions of vertical or horizontal lines, or to lines at right angles to each other as widths and breadths. There are three certain dominant proportions decided by the primary requirements of the plan, and along with these are associated a limited number of others; among them are found sufficient to regulate every dimension in the structure. My difficulty is this: a great many years ago I worked out this subject in great detail; in the end I had the equivalent to a book in my head, but there the book has remained, and it is excessively difficult to give the substance of an extended theory in a very few words. I will only trouble you with a few of the results. Mr. Penrose gives a dimension for the front top step which by the ratio 4 to 9 brings out a length of 228·017, which differs from the measured length only 0·024 —a difference of decimal places which in a length of 228 feet is ridiculously small. It is matter of wonder how the architect could have secured work of such marvellous accuracy. The proportion of full height to length is again determined by the simple proportion 2 : 7; with still more minute exactness, 2 : 7 : : 65·185 : 228·147 as against 228·147 measured. Again, when we look at the front of the Parthenon, there is one conspicuous parallelogram exhibited by the height of the columns with the entablature relatively to the top step. By the same proportion as the general plan of the Parthenon, 4 to 9, we have this result: the top step being taken as 9, the point height of column and entablature comes out as 45·0426, against the measured 45·046. I could cite a long list of other coincidences as critical and as precise—so precise that they might be mistrusted, but that they are based on the measurements of Mr. Penrose taken independently of this theory and anterior to its formation. I am myself quite unable to resist the cogency of agreements so consistent and pervading, and to believe that the coincidences could be accidental. There is one more leading proportion that I will trouble you with, as it is particularly important and involves a principle which I find in all the best Greek architectural work. In Greek façades the height of the column, which may be taken as the vertical member, always compares with the sum of the horizontals, which are the other members, and invariably in a ratio with a difference between the terms of 1 (as 4 : 5; 9 : 10, &c.), that difference being as consistently given in favour of the column. In early work the difference was rather given in favour of the horizontal than the vertical, which gave a degree of heaviness to Greek buildings of that period. I take shame to myself for not having pursued this subject further, considering how important it is, but the fact is, Greek architecture has been to a certain extent under a cloud for some years. I had the pleasure of the acquaintance of your first professional

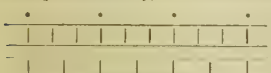
President, Professor Cockerell; and at the time he was bringing out his valuable book on Ægina and Bassæ I brought this subject before him. He was good enough to give me an appointment, and we had an evening together over the matter. He put me through my facings and cross-questioned me pretty strictly, but the end was that he recognised the force of my positions and invited me to add an appendix to his book, liberally according me what space I liked and what illustrations I wished for. I gladly availed myself of his offer, but hardly know whether to blame myself or to excuse my modesty for not having abused his generosity in the interests of the arts and trespassed upon his indulgence as I have now been trespassing upon yours.

H. H. Statham, *Fellow.*—I wish to say a few words on the question, not so much from an arithmetical as from an architectural point of view. In the first place I must protest against the indulgence of a tendency to over-ride all architectural design with figures. Instances of this tendency are furnished in Mr. Pennethorne's beautifully illustrated book; as, for example, in a diagram of an Egyptian order which is divided into fifty-six parts, of which thirty-nine go to the shaft of the column, three and a-half to the base, and three and a-half to the abacus. If things are to be divided into such small fractions, it would be quite possible to make mathematical ratios out of the wildest Gothic building that ever existed. There is no need to go to Greek architecture for that. To come to the main point of Mr. Pennethorne's Paper, he wishes us to believe that the Greek architects designed their temples to be seen from one point only, in such a way that the proportionate ratios of the various parts should appear right from that point. There are two statements incidental to the argument to which I must take exception. Firstly, this comparison is made, "To attempt to explain the reason why certain proportions should produce an agreeable impression on the eye, which by universal consent they were acknowledged to do, is I feel impossible. In music we can give no reason why certain harmonies and scales should produce an agreeable impression on the ear, or why many other intervals might be selected which would be discordant." Now, speaking as a musical man, I must say that is an entire misconception. The reason why certain notes harmonise and others produce discords, when heard in combination, is perfectly known, and is a matter capable of the most rigorous scientific definition, in a manner to which there is nothing analogous in architectural design. It cannot be mathematically proved that certain proportions in Greek temples are necessary for harmony of design in the same way in which it can be proved that two notes must have a certain ratio of vibrations in order to harmonise.* The second point to which I must take exception is in

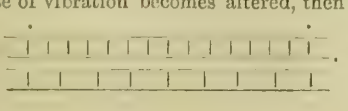
* As there seemed to be a good deal of misapprehension on this point, it may here be stated a little more precisely. A musical note is distinguished from a non-musical sound (a "noise") by the fact that it produces vibrations of the air in a regular isochronous rhythm, while noises produce vibrations that are irregular in duration; and a concord is formed by the sounding together of two notes of which the vibrations are in such a ratio that a large proportion of them are synchronous at regular intervals. Thus in the most perfect concord, the octave, the vibrations of the two notes are as 1 to 2 (264 and 528 per second for mean C and the C above it), so that the vibrations of the lower note synchronise with every alternate one of the upper note



; in the next most perfect concord, the fifth, the vibrations are as 2 to 3 (264 and 396 per second), so that every second vibration of the lower note coincides with every third one of the upper note



. When the number of vibrations is so disproportionate as to produce very few synchronous vibrations at long intervals only, it becomes a discord; or when one note is ever so little out of tune so that its due rate of vibration becomes altered, then the result is what may, in visual representation, be compared to a vernier scale



. Here the upper note of the octave is *flat*, that is to say, it is

reference to the alleged authority of Vitruvius for the theory propounded. That author is quoted as saying, "Under every peculiar circumstance great judgment is necessary in *calculating* the effect that will ultimately be produced"; the word "calculating" being italicised by Mr. Pennethorne. Now, the original runs thus:—"Cum ergo constituta symmetriarum ratio fuerit et commensus ratiocinationibus explicati, tum etiam acuminis est proprium *providere* ad naturam loci, aut usum, aut speciem, et detractionibus vel adjectionibus temperaturas efficere, uti cum de symmetris fit detractum aut adjectum id videtur recte esse formatum, in aspectuque nihil desideratum." Now the word "providere" cannot by any stretch be made to mean "calculation" in the arithmetical sense: it is simply to "foresee," or to "provide for." The chapter, again, from which the quotation is taken, is headed, "On the Proportions of Private Dwellings," and has nothing to do with Temples; and it concludes with this passage (Newton's translation):—"It cannot be doubted that we should diminish or enlarge objects according to the nature of their situation, in order that no part of the work may appear unsatisfactory; but this must be effected by the acuteness of genius, *and cannot be taught by rule*." So much for the chapter of Vitruvius, which is quoted as part of the basis of Mr. Pennethorne's theory. In regard to the main point I cannot believe that the architects of the Parthenon considered that the beauty of the building was dependent upon its being viewed from these special points. The points of sight indicated by Mr. Pennethorne, at which the mass of the building subtended an angle of 45° to the eye, are too close, as the eye can only take in 33° at one view. Then the calculations can apparently only be made to fit by referring them to three different bases. In one passage in the Paper (p. 107, *ante*) we are told that the vertical heights are commensurate with the length of the *upper* step; on Plate 4 of the illustrations it is observed that the mass of the building may be regarded as a cube comprised between the *middle* step and the projection of the cornice; and on page 111 we are referred to the diagonal line joining the extreme angles of the podium. If the Greeks had really been proceeding on such a severe logical principle of design as has been suggested, it is inconceivable that they should have shifted their calculations from one base to another in this manner. If they had calculated the heights in elevation on the basis of the upper step, surely they would have calculated the perspective mass, if on anything, on the diagonal of the upper step. But the most serious difficulty is one which, though made obvious in Mr. Pennethorne's book, has been ignored in the Paper read before the Institute. The two fronts of the Parthenon are architecturally identical, but the level of the ground for the eastern point of sight is ten feet higher than that for the western; the corrections which are right for one end of the building must therefore be all wrong for the other end. The explanation suggested for this in the book is still more extraordinary: it is, that a longer diagonal is furnished for the eastern end (and the spectator thus thrown further back) by the wider extension of the platform at the base of the eastern steps. This platform is nearly level with the ground, and (if Mr. Penrose's drawings are to be accepted) actually dies into the level of the rock at the north-east angle to which the diagonal is referred—so that we are asked to believe that the real beauty of the east front depended, in the mind of the Greek architect, upon directing the attention, not to the main mass of the building, but to this entirely subordinate point in the substructure. That is a theory which, to my mind, refutes itself.

Arthur Cates, *Fellow*.—Reply to the observations which have been made is anything but easy. The figures and results worked out by Mr. Penrose demand, for their verification or to detect their

vibrating too, slowly; and consequently instead of every other of its vibrations coinciding with each one of the lower note they only coincide occasionally at considerable intervals, and the chord is "out of tune." Now all this is as much matter of mathematical and scientific demonstration, and as inherent in the nature of things, as that twice ten is twenty, or that the angles of a triangle are equal to two right angles. Surely that cannot be said of the mere arrangement of heights in buildings so as to have six heights in the column and one in the architrave, &c.—H. H. S.

fallacy, no less time than he has devoted to their calculation; then, the path to perfection which Mr. Watkiss Lloyd has most gently indicated, is by him so thickly strewn with fractions of all denominations, that I hardly care to tread it; and Mr. Statham is too formidable an antagonist to be dealt with summarily, or to be answered effectively on the spur of the moment.

I must, however, first on behalf of Mr. Pennethorne express to the Institute his thanks for the attention which has been given to the subject he has brought forward, and for the large space it has been permitted to occupy in the Transactions; and great has been his regret—as it must have equally been to all of us—that he has not been able himself to be present, and with his own lips explain and justify his theory, and convince the few who doubt. It is even more to be regretted that this evening Mr. Penrose has not been able to attend, and especially so because almost simultaneously with the announcement of this Paper a distinguished French architect and accomplished scholar, in an important work on the History of Architecture,* most distinctly and directly challenged the accuracy of the observations on which Mr. Pennethorne and Mr. Penrose base so much. M. Lesueur, in terms which leave no opening for misapprehension, declares that horizontal curves do not exist in the Parthenon. Thus all the elegant refinements dwelt upon by Mr. Pennethorne are mere myths and delusions; the skill and labour devoted by Mr. Penrose to the measurements, and the learning and pains expended by Mr. Pennethorne upon the elucidation of his theories, with the production of that magnificent volume to explain them, are all utterly wasted, and why? M. Lesueur, putting aside the labours of two such acute observers and the result of their patient studies, and utterly heedless of what Vitruvius has written, declares *ex cathedrâ* that the differences of level in the stylobate do not form any portion of curves, but are simply the result of dislocations of the structure arising from settlement in the foundations, and that the only curves are those which existed in the imagination of Mr. Penrose, and which he found because he went to find them; while the appearances he observed arise entirely from subsidence of the foundations. Mr. Christian reminds me that the Parthenon is founded on rock. It is so; but in parts the rock is a long way down: for while, in the centre of the north side, the rock is close to the surface, the depth increases at each end of that side, and on the south side the height of substructure above the rock is about twenty feet. But while M. Lesueur, in 1878, so boldly demolishes what we had accepted as ascertained facts, some sixteen years earlier a no less distinguished German, Herr Carl Boetticher—the author of the well-known "Tektonik der Hellenen"—had published the results he had arrived at during a mission to Athens, in the spring of 1862, on behalf of the Prussian Government. In this book† he, in a no less direct manner, challenges the deductions of Mr. Penrose, and examines in minute detail his measurements, and endeavours to support his own allegations by calculations and diagrams. He denies the necessity for any optical corrections, or that any were made in the original construction; and he attributes to the result of subsidence of the foundations and other defects in construction that state of things which we believe to have been an integral part of the first construction and essential to its beauty and perfection.

On these grounds, therefore, the absence of Mr. Penrose is much to be regretted, as his reply to the learned and impetuous Frenchman, and the not less learned but more patient German, would have been of the highest interest. Both appear to me to have pretty well made up their minds to a foregone conclusion, and not having appreciated, or having altogether overlooked, the testimony of ancient writers—as so fully quoted by Mr. Pennethorne—regard the alleged necessity of optical

* Lesueur: J. B. "Histoire et Théorie de l'Architecture." 8vo. Paris, 1879.

† Boetticher, Carl. "Bericht über die Untersuchungen auf der Akropolis von Athen im Frühjahre, 1862. Mit XII. Tafeln." 8vo. Berlin, 1863.

corrections as a delusion; and Herr Boetticher even refers to instances, such as the stylobate under the columns of the new Museum at Berlin, where, notwithstanding the length of the line, no such hollowing as the words of Vitruvius would indicate can be perceived.

It is hardly necessary to allude further to this idea of subsidence of foundations; for, although I place implicit reliance in the measurements of Mr. Penrose and the deductions of Mr. Pennethorne, the probability of the correctness of the facts and of the theory derives the strongest support from the ancient writers above referred to, and from the necessity which actually exists for such corrections. This is shown by a building recently erected in Athens; it is the New Academy founded by Baron Sina, and erected from the designs of Herr T. Hansen of Vienna, with the collaboration of Herr E. Ziller of Athens. The material is of the finest white pentelic marble, wrought in a manner only surpassed by the workmanship of the Parthenon; the design is excellent, and every detail has been studied with the most scrupulous care from the finest examples in Athens. In all respects but one the success of the architect has been as complete as well deserved—the one defect being that optical corrections have been neglected; and hence in the brilliant sunlight the effect of the portico (to my eye at least) is not agreeable, the line of the entablature and the sides of the pediment appear sunken and concave, and the end columns of the portico appear to lean outwards. I am not alone in observing this, for Monsieur E. Burnouf, at that time Director of the French Academy in Athens, when explaining to me his very ingenious theory of the causes which produce the remarkable effects of apparent distortion observable in lines known to be perfectly straight, directed my attention to this building as affording an illustration of such distortion. This essay of M. Burnouf, referred to by Mr. Penrose in his Paper on "The Optical Refinements of Greek Architecture" read before the Institute in 1877,* will be found printed in the *Revue Generale* (vol. 32, pp. 146-153);† it merits the careful consideration of all those who desire to follow up the subject, or who may, by the specious suggestion of "subsidence of foundation," be led to attach less importance to the subject than it merits.

Mr. Penrose not being here to explain the remarks he has communicated to us, and it being impossible to examine the accuracy of his calculations without devoting to them probably as much time as he may have expended in making them, I can only observe that really so far as I was able to apprehend the figures—when writing them for you on the black board—the differences appeared to be but minute; and I could not appreciate any good ground for giving a preference to the fractional system of Mr. Watkiss Lloyd over the more elegant and logical one propounded by Mr. Pennethorne. I need not discuss with Mr Statham his observations on the subdivision of the Egyptian column, for the illustration itself in the book will be a sufficient answer; but this is certain, that the Egyptians used a fixed canon of proportion for the delineation of the human figure, and that after the 26th dynasty this canon underwent a slight modification.

The principle which I consider to be a chief mainstay of Mr. Pennethorne's theory is, that the Greek architects designed their buildings to be seen from a given point of sight, and perhaps I ought not to be surprised that this does not always at the first blush command universal acceptation. But the Greek architect was master of the situation; in every instance the temple was so situated within the peribolus, and the entrance to the peribolus was so placed that the principal and only general view of the temple was angular. By reference to the plan of the Acropolis it will be seen that the only approach through the Propylæa leading to the pedestal of the statue of Minerva Promachus fixed the point of view, and the space south of that approach and the other parts of the Acropolis having, as we know, been filled in with edicules, enclosures, shrines, trophies and various constructions, the

* Sessional Papers, 1876-77, p. 108.

† Burnouf: Emile. "Explication des Courbes dans les Edifices Doriques Grecs."

fragments of which even now strew the rock, the point determined by Mr. Pennethorne was the *only possible point* for a complete comprehensive view, and therefore was the point to which it is reasonable to infer that the geometric design was reduced, and to which the optical corrections were referred. Whether it has been found that 33° is a better visual angle than 45°, or not, does not in any way affect the question; there are the conditions and the angle is 45°. Had the Greeks thought 33° better, and the conditions permitted its adoption, no doubt it would have been so adopted; but it was not, and that it may or may not be a better visual angle does not affect the question under consideration in any way. Not only at the Parthenon was this angular point of view a condition absolutely imposed on the spectator, and one which it was not possible to avoid, but the like conditions existed at Egina, at Priene, and probably at Ephesus. Mr. Statham has apparently overlooked the fact that the first and principal view was from the north-west, and that the design of the north and west sides having been determined by and referred to that point of sight for that view, the elevations to the east and south—in respect of which these corrections are of less importance—must be in a great degree determined by them; and although the difference of level he mentions does exist, the effect of the corected elevations east and south, notwithstanding the manner of arriving at them does not please him, would be more agreeable than the uncorrected elevations would have been. I cannot follow Mr. Statham in his objections to the illustration taken by Mr. Pennethorne from music; his own so-called reasons were simply facts, and the reason remains undetermined, as does the reason why certain ratios of lines and areas one to another should be agreeable to the eye.

In one respect I have been much disappointed that no question has been raised on the theory of the correction of the visual angles; three large diagrams have been prepared by Mr. Robinson to controvert the mistaken ideas of a writer in *The Builder* (vol. 36, p. 740), who, in a criticism of Mr. Pennethorne's book, took an erroneous view with regard to the correction of the visual angles. This point, however, has not been referred to in the Discussion, and I must therefore assume that the reply made in the columns of that journal has sufficiently shown that Mr. Pennethorne's theory must be admitted as correct. I should have been glad to have met objections of that kind, or to have entered into detailed explanations of the diagrams exhibited, and of the theory they are intended to illustrate; and more advantage would have arisen from such a discussion than can possibly follow any consideration of the correct interpretation of "providere." I certainly think Mr. Pennethorne's use of the word "calculating" is quite justified, and that Mr. Statham would have done well not to have quoted Newton's paraphrase of Vitruvius, as the words "*and cannot be taught by rule*," on which he has laid so much emphasis, have no equivalent whatever in the original; they are not even hinted at in any way. When they are omitted, the passage, even in Newton's words, would support Mr. Pennethorne's views. The concurrence of the testimony from the ancient authors collected by Mr. Pennethorne is, however, so complete, and the evidence to be deduced from Vitruvius—when the text is taken freed of the encumbrances of commentator and paraphraser—is so conclusive, that I am at a loss to understand how any one can raise the objections we have heard. It is very satisfactory indeed to hear from Mr. Lloyd that his system of many fractional parts works out so nicely, but this result is exactly what one would expect from a system adopting such fractions as $\frac{11}{17}$ $\frac{17}{19}$, or apparently any other which might be convenient, but in which no principle is evident. Neatly, however, as this fractional system may be made to fit in with actual dimensions, I cannot think that Mr. Lloyd desires to suggest that the Greek architects actually designed their edifices on such a basis. I would rather expect him to acknowledge that the buildings, having been designed on the same perfect system such as that now under consideration, his fractional theory is found to apply to the results so obtained.

I am well aware that the propounder of a refined theory, such as has been submitted to you in this Paper, is likely to be considered as having taken up a mere fancy; but everything concurs to support the theory which Mr. Pennethorne has so carefully elaborated. The Paper read to you is but an introduction to that theory which in his book he has so fully worked out in its application to every detail. After careful study of that elaborate work, and of the references to ancient writers therein given, you will, I am sure, be convinced that if it is not absolutely proved to be the principle adopted by the Greeks, the probabilities are so strong in its favour as to almost become certainty; while on the other hand it will seem quite unlikely that men having so perfect an acquaintance with, and appreciation of, the most refined curves, which they used in all profiles,—and having also an extended knowledge of the laws of optics,—should have executed their temples on the basis of a fractional system of minute subdivision, and on the drawing board and square system, as we do now (with what results I have already shown), rather than to have carried into practice the principles so clearly laid down by the ancient authors; and having first so designed a building that geometrically its proportions were harmonious, so to correct those dimensions thus obtained with reference to its position, the visual angle under which it would be seen, and the optical exigencies of the case, as to produce in fact a building which shall have the same harmony of proportion in effect as the first design had in its mere geometrical projection.

The PRESIDENT.—It is now my pleasing duty to propose a vote of thanks to the author of this Paper—a Paper that has provoked a most valuable discussion. To my mind the researches of Mr. Pennethorne and Mr. Penrose, and also of Mr. Watkiss Lloyd, point to the fact that these curves cannot be due to settlement. As to the question whether so refined a people as the Greeks adopted some system of curvature to overcome the optical illusions with which architects are familiar, I do not think there can be any difficulty in accepting that probability. In ordinary practice the unrefined moderns agree that a column must have *entasis*, that domes must be raised to produce the effect which we wish them to produce, so that the column should not look hollow, and the dome should look like half a sphere. I felt that Mr. Statham, in his remarks with respect to the synchronism of musical chords, went a long way, perhaps unintentionally, to establish Mr. Pennethorne's and Mr. Penrose's contention, because we can hardly suppose that the delicacy of appreciation of one sense is different from the delicacy of appreciation of another sense, and that the ear can be much more sensible, and much more powerful to appreciate what is called harmony, than the eye—especially the educated eye—is; therefore the fact of his speaking with the power of an experienced musician really almost seemed to me to carry, by analogy, the argument a long way in favour of that which has been addressed to us. In conclusion, I wish to call attention to Mr. Pennethorne's liberality to us in the shape of the work lying on the table. It is a work of most extreme care—the result of the labour of a life time, and of love for art which deserves every appreciation at our hands. It is called "The Geometry and Optics of Ancient Architecture," and I must refer you to the work itself to see how far the extension of the principle set forth in it is carried. That a gentleman like Mr. Pennethorne, not a professional architect, should have such strong and enthusiastic artistic taste—such mathematical power as to go into abstruse questions like these, and incur the large expense which the publication of this splendid work must have involved; and that he should have brought his views before us in the way he has done is, I think, a matter not so much for criticism as for gratitude and commendation.

VII.—ARCHITECTURAL FOLIAGE. By James Kellaway Colling, *Fellow.*

Sculptured foliage when well and successfully engrafted upon architecture never fails to greatly enhance its richness and elegance. This is fully in accordance with all the most perfect developments of architecture as seen in the best works which have been handed down to us from the earliest ages, whether they are the remains left us by the Egyptians, the Greeks, the Goths, or any others. This probably will be conceded me without question, and although I have read Papers here on two former occasions upon the same subject, architectural foliage being an important and an interesting one, I need, I am sure, make no further apology for again bringing the subject before you.

Unfortunately foliage is not unfrequently applied for ornamental purposes in the worst possible manner, but when well designed and executed upon correct principles, not overlaying the architecture itself, there can be no doubt of its vastly improving the character of those works to which it may be added. There are, however, many cases where it is often injudiciously excluded, and there has been, in times past, a tendency to substitute for it plain moulded work. In numerous instances, I am aware that there is a fatal obstacle to the introduction of foliated ornamentation, because of its expense and costliness; but we not unfrequently see very elaborate attempts at decoration by the adoption of intricate moulded work, costing evidently large sums of money, which add but little to the beauty of the building. There are other cases, however, which are still more serious, where carving and sculpture of the highest class are added in the most profuse manner, but where the money and labour are entirely thrown away, because such decoration is applied upon an improper or a false principle.

In all early forms of art we find plain surfaces invariably used for the development of painting or sculpture. In the Egyptian and the Assyrian, walls were made eloquent by hieroglyphics and sculpture embracing animal and vegetable forms. In the Indian, Persian, Moresque and the Arabian, we observe that the same principle was adopted, and that the buildings and other works of these nations were literally covered with elegant combinations of foliated form, and plain moulded work is scarcely to be found. Yet all these elaborate enrichments were not added to or upon the works, but were taken out of them, and therefore they did not destroy their breadth or character.

It is in Greek architecture that we first see a development of plain surface, where although friezes and pediments were often enriched with matchless sculpture, architraves, cornices and walls were left plain and bare, or were enriched only with plain moulded forms. The Greeks, however, appear soon to have disliked the appearance of many of their plain surfaces, and supplied the deficiency by painting. The Erechtheium was, I believe, the first temple erected in Athens where the mouldings and friezes were enriched by foliated sculpture. This coming, as it probably did, a few years after the completion of the Parthenon, looks very much as if it may have caused a sort of dissatisfaction with the appearance of the latter temple, on account of its comparative plainness, and thus may have arisen a wish to correct this by the addition of painted decoration. They then covered their plain architraves with the meander, their unsculptured mouldings with the anthemion and other ornaments, and the lacunaria of their ceilings with the star or arrangements of foliated forms. Having as we all know done so much, I have no doubt that they also enlivened their walls with scenes from Grecian history, although no remains of such paintings may be found at the present day.

The Romans carried out the enrichment of their mouldings with sculpture to a greater extent

than the Greeks, and they also enriched their friezes with many fine arrangements of foliage associated with animal form. But besides these they enriched many of their plain surfaces with sculptured foliage, as in the architraves of their entablatures, as well as the coronas and soffits of their cornices. Showing also their increased partiality for foliage, they greatly developed and perfected the Corinthian capital, but not only that, they added foliage to the Ionic capital, producing what has been called the composite, and so considerably enhancing its beauty as an enriched capital. They panelled too some of their pilasters with grand and magnificent foliated scroll-work. But with the exception of these last, this decoration must have been placed at too great an elevation to have been properly seen. It was left, however, to the modern European to carry out these antique styles devoid of *all* enrichment or sculpture, except long lines of bare moulded form. He is the only artist who deliberately sits down and wastes his time over the contours of quirks and ogees, and by the aid of the plasterer's mould runs his entablatures, and borders all his windows and doors, with his surprising combinations of mouldings. His plain surfaces are relieved only by scratching upon them lines to indicate colossal blocks of stones.

I would, however, call your attention more particularly to the improper application of decorative sculpture. We have been told by one whose authority upon such points cannot be too highly valued, the late Mr. Owen Jones, as well as by Pugin and others, and I suppose we all acknowledge it to be true, that construction should be decorated, and that decoration should never be purposely constructed. Yet we constantly see buildings erected where the so-called decorations are added to or applied upon the architecture, as if the very opposite were the rule. Buildings, in many instances, have become overloaded by applied ornament, instead of its being formed naturally out of the construction. Festoons and swags of gigantic size are pinned up to the surface of the walls by pateras or lion's heads, and tied there by impossible ribbons, while little window pediments are broken in the centre in order that their cornices may be piled up with immense loads of sculpture or foliage. In many modern French ceilings festoons of *papier mâché* are frequently introduced, actually hanging away from the ceiling, looped up by their extremities. Surely if enrichment is a portion of architecture, and an integral part of it, no greater violation could be imagined than thus to separate or hang it up, as if ready to fall upon the spectator's head. Unfortunately there is a precedent found in antique architecture for these applied forms. The Corinthian capital is not a composition which grows out of and forms a part of the column itself, like the grand old Egyptian capitals, but all the parts are applied or added outside the bell, which is the actual capital—a circumstance which to say the least of it, has greatly aided the labours of the modern plaster-caster; but it is not composed upon such principles as should be the rule in architectural ornamentation.

It will be considered, no doubt, very fastidious and even presumptuous upon my part, thus to condemn a form of capital which has received the support of so many centuries. I am not, however, the first to point this out; the object, however, is not so much to find fault with the Corinthian capital, which doubtless will still continue to be admired, and be most faithfully copied for many generations to come, but to endeavour to point out the defect which, more or less, runs through Greek and Roman architecture. Although it may not be a very prominent fault in antique examples, yet it has given rise to most unfortunate results in modern times.

No period in modern English architecture is more justly noted for foliated carving than that belonging to the school of Sir Christopher Wren, at the head of which stood Grinling Gibbons. For skill in workmanship, dexterity of manipulation and close imitation of nature, this period stands perhaps higher than any previous or later one. It is, however, to be regretted that so much of this remarkably beautiful carving should be afterwards applied and added to the construction which it

is intended to enrich. Ornament, to be true, must be subservient to the purpose and to the architectural forms of the work itself. The features themselves should be enriched, and as a general rule ornament should be taken out of the material—sunk below the surface and not laid upon it. A work may be literally covered with ornament which will immeasurably aid the beauty of the architecture when used in its legitimate place, as in the walls of the Alhambra, or to take a more humble but not less striking example, in the elaborately carved but simple form of an Indian sandal-wood box: it is enriched without anything being added to it, or altering its primitive form or construction.

The great defect of modern ornamentation is that it is so often represented as if it had weight in itself and that it was absolutely necessary to hang it up, or that it should stand upon its own base, as in many of the otherwise very beautiful Italian arabesque pilasters.

The festoon, as a means of ornamenting a work, has been used in French and Italian Renaissance more than any other form, but it is essentially a bad one, and it is at the same time one of the most objectionable forms of constructed ornament. From its very nature it is *added* to the thing ornamented; it often overlies architectural features, and is formed of an artificially constructed collection of miscellaneous flowers and fruit. Unhappily it appears to have been coming into fashion again of late. Its origin, there cannot be a doubt, was derived from the Roman altars, which were decorated in the earliest times with the actual heads of the animals which were sacrificed. These were placed at the angles of the altar, and festoons of flowers were looped up from the horns and tied with ribbons. They were afterwards carved upon the altars in stone or marble, and from them the same decoration was soon transferred to the friezes of the temples. It therefore became a precedent for architectural decoration and has been used ever since in every conceivable position. In festooned bands round buildings; under windows and over windows; over doorways; over arches and between arches; between capitals or attached columns or pilasters; hung from eye to eye of voluted capitals and consoles, as well as on ceilings and on mosaic floors—in fact, there is scarcely any position in which the festoon has not been used. Again, festoons are not only made up of all manner of flowers and fruit, strung together without any cohesion of parts, but of nearly everything that can be imagined, such as musical instruments, books, dead birds, shell-fish and a multitude of other objects, as well as the ever indispensable ribbon.

Grinling Gibbons appears never to have been able to get on without festoons, ribbons and drops or pendants in his work. The example of a panel from St. Paul's Cathedral is a good specimen of this. It is executed in the usual manner that he adopted for nearly all his most important works: that is, it is carved in lime tree and planted upon an oak panel. The composition is rich and bold, but somewhat confused, and at first sight the manner in which it is composed cannot be clearly distinguished. In the centre there are a pair of cross trumpets tied together by a ribbon. Then there are in the upper part interlacing scrolls of a conventional type peculiar to Grinling Gibbons —for which, in my opinion, he deserves more credit than for any other part of his work—but to which I will refer presently. Out of the upper part of the scroll (I am now explaining one half of the panel) there drops a swag or festoon of small flowers, either periwinkles or primroses, which runs to the upper angle of the panel, and from which, hung to a single flower, drops perpendicularly a bunch of trilobed leaves, forming the end of the design. But besides this there is a larger and bolder swag, which is in much higher relief than any other part, extending from the knot of the ribbon at the junction of the trumpets, sweeping to the bottom of the panel, and going right up to the extreme angle again, from which the smaller festoon and drop hang. This is repeated in the other half of the design, all, except the scrolls, being supposed to be hung up by artificial means. A portion hangs from the scrolls, but how they and the angle flowers are supported does not appear.

The peculiarity of the scrolls, which appears to be characteristic of Gibbons's work, is that instead of the leafage forming a sheath, as in nearly all classical foliage, it grows out of the stem itself or arises from the other side of the stem, as in the examples from St. Mary Abchurch. The leafage is from nature, taken evidently from the hawthorn, and in some cases, from the celery-leaved crowfoot. In richer work, as at St. Paul's, the leaves are double : that is, one lapping over the other. A defect in these latter scrolls is that they grow in two directions : that is, out at both ends, which might have been easily avoided. Some of the best and richest of Gibbons's scroll-work of this kind, of great excellence and beauty, is to be found in some richly ornamented and pierced oak doors in the library of Trinity College, Cambridge.

The fruit and flowers in the festoons are all accurately and very beautifully copied from nature ; they consist of peonies, anemones, crocuses, primroses, tulips, peaches, peas and other fruits. All are separate and disconnected, except occasionally by some faintly carved lines or strings at the back. No part is growing but is in "still life ;" the fruit or flowers are separately fastened in their places by means of screws, nails and glue, and when, in very high relief, they are not worked out of one solid piece of lime-tree, but are formed of different layers of wood, about two inches thick, placed one upon another. There is no undercutting, properly so called, as the whole is backed off behind, and shaped previously to its being planted on the ground, which gives the work as much relief as if it consisted of actual flowers. This is not the case with the oak scroll-work which I have mentioned, as that from St. Mary Abchurch, and the library of Trinity College, Cambridge, which is all carved out of the solid.

It will be perceived that the panel to which I have referred is made up in two different styles : the natural in the festoons, and the conventional as seen in the scrolls. Now this manner of mixing up the natural and conventional is common to most of the foliated work of the Renaissance period. Natural ivy, vine, oak and other leaves, as well as fruit, are introduced occasionally among foliage which may be described as purely architectural, and in such an incongruous manner that they never properly amalgamate with the other portions of the composition. Gibbons went in boldly for nature in his own style, and whenever he adopted the natural he made the conventional quite subservient. But in the French and Italian the natural is usually introduced as if it were only an accessory. There were some exceptions, as in the border round Ghiberti's doors, which is entirely natural ; but, as a rule, nature was introduced but timidly. There are many examples, however, even among Roman work, where natural foliage was thoughtfully and most artistically followed and worked out, as in the example from the stem of a fountain in white marble, found near Tivoli, but now in the British Museum. A spiral line is formed round the shaft or column by a serpent, and a branch of ivy grows up from below filling up the spaces between the coils of the serpent in a very graceful manner. The natural flow of the leaves with their long foot-stalks, and the bunches of berries, are most faithfully and artistically rendered. Even the little buds in the axils of the leaves are introduced, showing with what minute attention they observed nature. The leaves, also, are plain and undivided, as they invariably are in nature, when found near the flower.

There are numerous other instances in Roman work, where nature has thus been studiously followed ; more particularly in carvings from the vine, oak and ivy. Now what I want to elucidate by this is, that as there have been artists, even in ancient times, who have made a close and successful application of nature to art, by entirely throwing over the conventional treatment of their time, we, in the present day, should, like the ancient Roman who sculptured that beautiful stem of a fountain, throw aside all architectural precedents for foliage, except the principles upon which he worked, and boldly make our applications directly from nature. But instead of doing so, we, like many

of the Renaissance workers, who also strove to re-introduce nature, are so bound by conventional rule, that we are not likely, from this timid mode of proceeding, to succeed but in a partial degree, and by adopting two different manners we must fail in harmonizing them.

Artists and carvers are told by architects, and one hears it continually held up as law, that foliage for architectural purposes *must* be highly conventionalized, that it must not be too natural, and so on.

I was in a church the other day, which had been lately restored, and I remarked to the clergyman, "Why, what common-place designs all your new poppy-heads are." "Oh, yes," he replied, "our architect prefers them, the carver wanted to make some of them different, but the architect would not allow him to do so, but would insist upon his copying the old ones." In this manner, which is only too common a case, we are constantly trying to resuscitate the ornament of former ages. This plan will never lead to any good result, and will bring with it nothing but disappointment. For whether we essay to design in the style of the Greek, or the Roman, or the Gothic (for instance, as in the manner of the very beautiful foliage of the Early-English period), however much we may admire these works, they are all things of the past, and we never can by any mode of copying or adaptation make them applicable to the nineteenth century. There is therefore a paramount necessity for again having constant recourse to nature as the main element of the beautiful for architectural foliage.

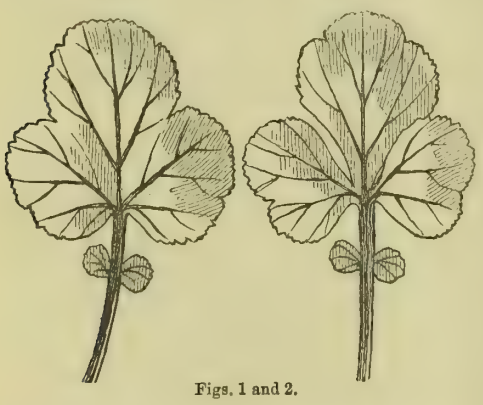
The best positions for foliage upon a building are in friezes, mouldings, string-courses, panels and diapers. Indeed it is in panels that we find the greatest development for foliage—and by panels I include spandrils and all ornamental forms of panels. In all cases, where I could, I would keep the most important sculptured decoration as low down as possible in a building, and not throw away work by placing it too high to be properly seen. Not that I would leave the upper parts plain, but I would have the ornament of a much more simple character and arranged to suit the respective heights. There are many instances where beautiful work has been thrown away in this manner. A notable example of this is the position of the Panathenaic frieze in the Parthenon. In the first place it must have been in a very bad light, and then the angle at which it had to be viewed was so steep and acute as to make it an impossibility ever to have seen it properly. Similar errors were made in Mediæval buildings. At Lincoln it is impossible to see the sculpture of the angel choir as it should be seen from the ground, although one is enabled to get a better view of it by ascending into the triforium. But even when there, you still look up and find that the elaboration of the work continues as it ascends, so that when the eye reaches the bosses in the groining you discover that they are just as delicately wrought and as highly finished as those parts below which are close upon the level of the eye.

In designing foliage we have chiefly two things to study. Form, and light and shade. In form the first thing we have to decide upon is the leading or setting-out lines of the composition. And whether these consist of the scroll form, the branched, the radiating or any other lines, they must intersect and divide the space to be filled in the same manner as the ribs and veins do the surface of a reticulated leaf. No portions must be left unprovided for, and they must harmonize with the bounding or other architectural lines of the work itself. These should be laid out upon a geometrical and somewhat regular and symmetrical plan, and we can but partially obtain any assistance for this purpose from nature. But there are some general ideas that we can gather, such as the scroll lines we see in tendrils and climbing plants, the various modes of branching, the reticulation of leaves and the radiation of flowers. Architectural foliage should represent natural growth, and not be formed with flowers, fruit and leaves picked and separated from life. In the Greek antefixal ornaments the growth of the plant is plainly set forth: Firstly, in the plant, leaves issuing from the ground; secondly, in the flower, stems growing out of them, conventionalized by spirals and crowned with the flower. In the early Gothic, as in the example from Stone church, the scroll form grows out of the

ground at the back and the different branches throw out leaves in a natural manner until the whole surface is covered. Crooked form, such as we find in nature, must be altered to the tangential or angular, or a combination of both. We should remember also that upright lines represent life, hanging or drooping lines decay and death.

Having decided upon the leading lines of our stems, the next process is to clothe them with leaves, flowers and fruit. Here it is that we may bring to our aid that variety and beauty of form with which nature supplies us so bountifully. As a general rule all well-marked and deeply-cut lobed leaves are most applicable to carving, such as the irregular lobed leaves of the acanthus, thistle, hawthorn, oak and the chrysanthemum; radiating leaves, as the vine and maple; or those which have separate leaflets, as the trefoil, cinquefoil, horse-chestnut, rose, ash and acacia. Perfectly plain leaves, such as the lilac, box, laurel and olive, are also very valuable, where simplicity and breadth of form are required; or the more complicated can be reduced to their first simple form. Nature proceeds in this manner herself, as will be seen by the diagram of the rose-leaf, No. 24 (these numbers refer to the illustrations given on Plates I and II), the leaflets of which retain the form of the heart-shaped leaf. Other fillings-in upon the more simple forms show how other leaves follow the same rule. In one leaf, the *Maranta*, nature has herself painted the forms of more complicated leaves upon the plain leaf.

Leaves mostly assume, more or less, the forms of the geometrical figures. The *Laurestinus*, No. 1, the Vesica. The *Cineraria Maritima*, No. 2, is of the same general form, but is cut into deeply rounded lobes, of the same type as the oak. All compound leaves still retain the general forms of the more simple ones, as already shown by the rose-leaf, No. 24. The dock, No. 3, has a leaf of an oval form, which is found again in the deeply crenate-lobed leaf of the greater celandine, No. 4. The heart-form is seen in the black bryony and violet, Nos. 5 and 6, and again in the leaflets of the clover, No. 11. The main ribs of the leaf of the black bryony, No. 5, assume very beautiful flowing forms, having a strong resemblance to the lines of the Greek honeysuckle. In the violet, No. 6, the ribs are quite different and branch from the midrib, while in the bryony they flow gracefully from the base of the leaf where it joins the foot-stalk. The ground ivy, No. 7, approaches very closely to the circle, and the two sorts of mallow leaves, No. 8, are of the same general contour, although the inner one is deeply divided. The water avens, or *Herba Benedicta*, No. 9, from which the Early-English foliage is said to be taken, gives a very simple trefoil. No. 10 shows the leaf of the same plant split into separate leaflets, to which state it attains by later growth. This is shown again in Figs. 1 and 2. The clover, No. 11, gives a very perfect trefoil, formed by three heart-shaped leaflets. No 12, which is the terminal point of the leaf of the sow thistle, gives the triangle, which is seen again in the young leaves of the ivy, No. 13. The ivy assumes three typical forms during its growth: the triangle, No. 13; the square or lozenge, No. 14, and at length, in its full development, the pentagon, No. 20. The terminal leaflet of the cow parsnip, No. 15, approaches closely to the diagonal square. No. 21 indicates the typical pentagonal form of palmate leaves, such as the maple and sycamore. The five-pointed form is still retained by separate leaflets, as in the passion flower leaf, No. 22, and the cinquefoil, No. 23. Nos. 16, 17, 18 and 19 give four typical forms of the hawthorn leaf in different periods of its growth. No. 16 shows its first appearance in the bud; No. 17, the centre-point advanced; No. 18, divided principally



Figs. 1 and 2.

GEOMETRICAL & TYPICAL FORMS OF LEAVES.

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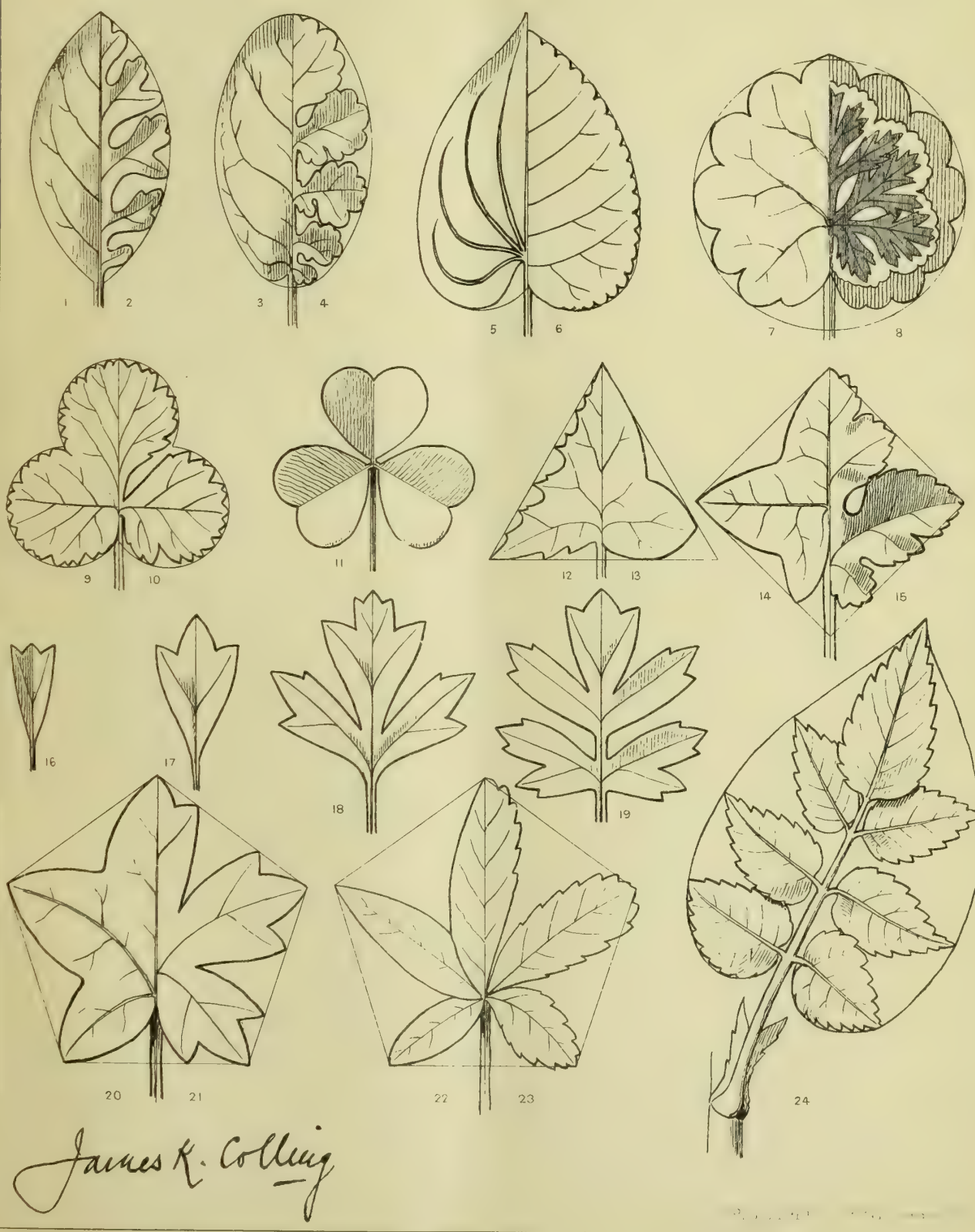

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LEAF EDGINGS AND LOBES

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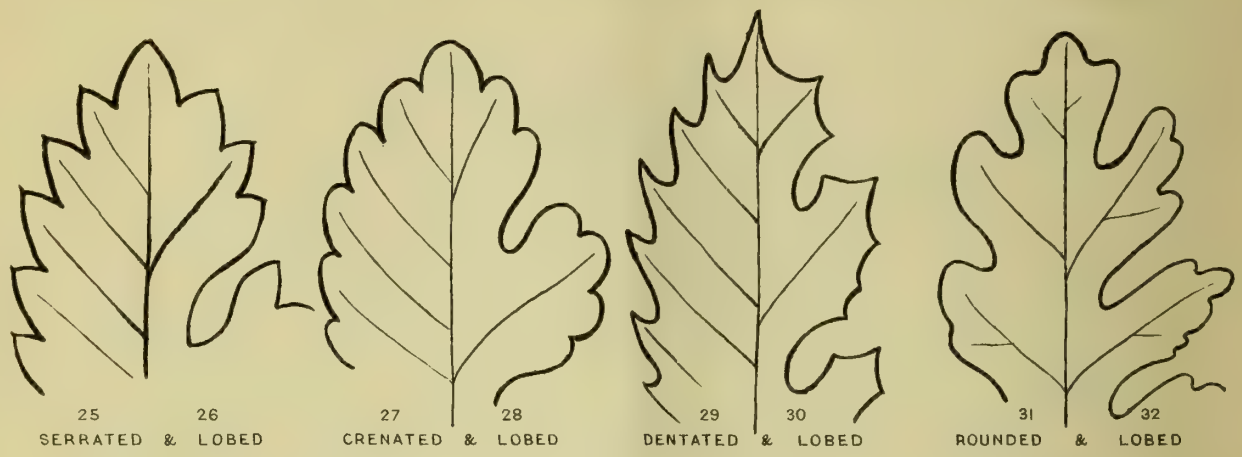
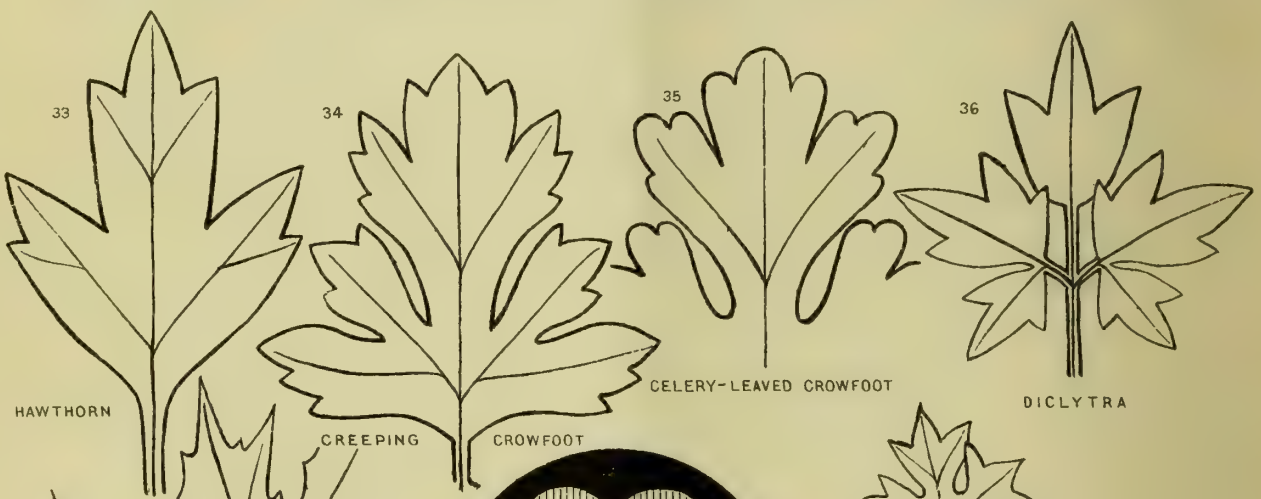


25 26 SERRATED & LOBED

27 28 CRENATED & LOBED

29 30 DENTATED & LOBED

31 32 ROUNDED & LOBED

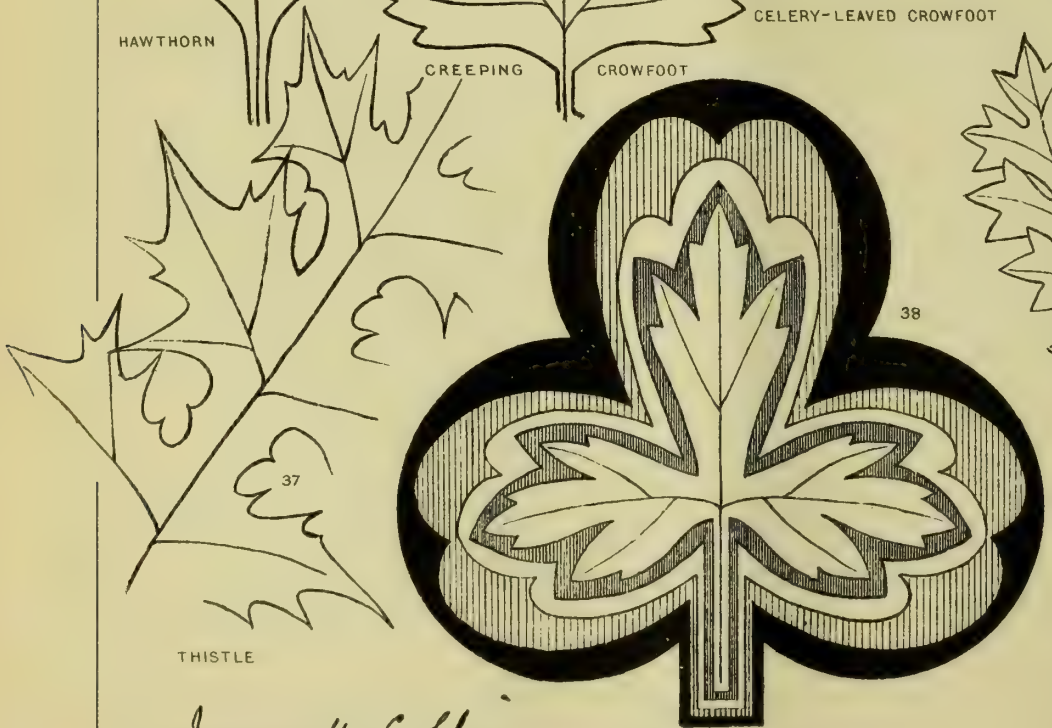


33 HAWTHORN

34 CREEPING CROWFOOT

35 CELERY-LEAVED CROWFOOT

36 DICLYTRA



37 THISTLE

38

39 GREVILLEA ACANTHIFOLIA

FIVE TREFOIL LEAF FORMS

James K. Colling

Photo Lith^d by C F Kell, London E C

into three lobes, with other minor divisions, its most elegant state; and No. 19, its separation into five lobes, by further development, where it loses the tangential lines of the last period and becomes more angular. It will be understood that, in these diagrams, some of the lesser and unimportant divisions are omitted. Main lines only are dealt with, and it may be further observed that, in using the leaves for decoration, many of these are again omitted, according to circumstances to which I shall more fully refer.

There are two modes of treating leaf-form. One, that of retaining the natural contour, as we usually find it more especially in older leaves, as in the maple and vine, No. 21, which start off with an abrupt angle or curve from the leaf-stalk. The other mode is that seen sometimes in young leaves, as in the hawthorn, No. 18 and No. 33, where the leaf flows tangentially and smoothly out of the foot-stalk. Most of the conventionalized architectural foliage is in this manner, as in the Early-English, Fig. 3. This difference in the form of leaves involves a different treatment in the composition of foliage for architectural purposes.

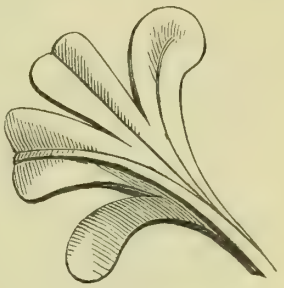


Fig. 3.

If tangential lines are used, the stems of the leaves form an important part of the composition, and the whole is generally arranged upon the scroll or flowing lines. But when the more fully developed and older leaves are used, as in the 14th century Decorated foliage, the stems become somewhat concealed and greater prominence is given to the leafage. The arrangement of the leaves becomes the first consideration, consequently the stems assume somewhat irregular lines.

When applying the forms of natural leaves, it is not at all necessary to follow them literally. They may be simplified, modified to make them more symmetrical, or altered to fill any particular form. Again, their outlines may be changed by adopting various cuttings, or subdivided by differently formed lobes, as in the diagrams. If we take, for instance, the most common of all leaf-edgings, the serrated No. 25, we are not bound to the number we use in a leaf, we can reduce them to three, five, seven, and so on for the entire leaf, just as it may suit our purpose; or we can subdivide them as in the hawthorn, No. 33; or they may be separated by lobes as indicated by No. 26. The number of these lobes may be made as few or as numerous as we choose, until we arrive at a many-lobed leaf such as the *Grevillea Acanthifolia*, No. 39. These lobes may be further subdivided as in the creeping crowfoot, No. 34, or separated into distinct leaflets, as in the *Diclytra*, No. 36.

Fig. 4.

The same treatment may be applied to other edgings, as in the crenated, No. 27; divided by lobes, No. 28; subdivided as in the celery-leafed crowfoot, No. 35; or into distinct leaflets, as in the cinquefoil, No. 23. This applies again to the dentated and rounded forms, Nos. 29 and 31, which may be subdivided as shown by Nos. 30, 32, and 37. The pointed forms may be softened into the rounded, as shown by the diagram of leaf upon leaf, No. 38. The upper form here is the leaf of the creeping crowfoot, which is next simplified into a leaf of three triple-pointed lobes, then into rounded lobes, which lie upon the clover leaf, the whole being bounded by the simple trefoil.

If we return and examine No. 26, the serrated-lobed leaf, as in the vine, we shall find that this is also the type of the conventional Greek acanthus foliage, Fig. 4. For whether we examine the *Grevillea Acanthifolia*, No. 39, the thistle, No. 37, or the natural acanthus, they all consist of serrated lobes, more or less sharply or acutely cut, but merging into the scolloped or dentated forms. Both these forms of leaf-edgings are found in Greek foliage. The scolloped is very prominent in the scroll from the roof of the monument of Lysicrates. It may not be inappropriate to call attention here to a similarity which I have lately perceived between the flower of the *Acanthus mollis*, and the sheaths or husks in that very elegant scroll. These will be observed to be of a particularly sharp, scolloped form. Now the flower of the acanthus is in the form of a tall upright spike, bearing a lage number of separate florets, something after the manner of the common foxglove. Each of these florets is accompanied by a stiff, spiky bract, which remains after the flower has disappeared. From out of this bract issues the seed vessel with its curved termination, precisely in the same manner as the spiral issues out of the sheath. May not these bracts which accompany the flower be the origin of the sheaths in the scroll? If they are examined there will be found to be a decided similarity in their forms and their positions. Now it should be remembered that the acanthus throws up no stem but the flower stem. All the main leaves issue from the root. Referring to the scroll, we see that the stem comes from the root-leaves and throws out a sheath, having much the character of the natural bract, but which is made to curl up in a spiral form, as it approaches the next scroll. Out of this bract or sheath spring a spiral and a continuation of the stem terminating in a second but smaller bract, from which the terminal scroll issues. Here again, then, we may see the growth of the natural plant, as I have already pointed out in the antefixal ornament; the scroll is a conventional representation of the flower stem, and the sheaths are the bracts which accompany the flowers. It appears to me that there is a remarkable resemblance between the natural and the conventional forms.

The flower bract is seen again in the Anthemion ornament from the doorway of the Erechtheium, where it accompanies the flower which proceeds from it. Its position in this instance, and its similarity to the natural bract, point unmistakably to its origin. There is a considerable variety in the character and outline of Greek foliage, showing decisively that it was taken from several species of foliage. In the leafage which accompanies the lotus from the capitals of the Erechtheium, the upper portion has dentated or scolloped edges, and is not divided into separate lobes, while the lower leaves are serrated or frilled—yet it retains the appearance of the acanthus in its being a plant as if issuing from the ground with the flower or lotus growing out of it. This retaining of the plant arrangement is found again in the Corinthian capital itself. The two lower ranges of leaves represent the plant, the scrolls the flower stems, whence issues the flower which forms the centre of the abacus. The turning over of the heads of the lower leaves is found, in nature, in the sea holly.

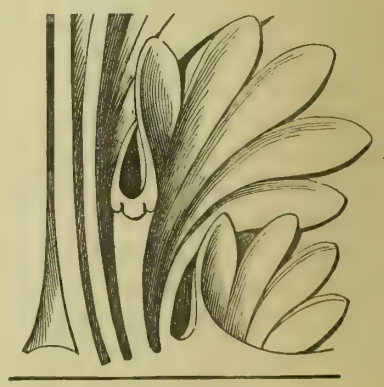


Fig. 5.

The crenate-lobed figure, No. 28, gives the type of the Roman acanthus foliage, which is entirely different from the Greek in having rounded or oval pointed divisions to the lobes, as in Fig. 5, which is from the leaves of the capitals from the Pantheon at Rome. There is an exception in the capital from the Temple of Jupiter Stator, where the divisions of the leaves are more pointed. In this foliage there is no great resemblance to any particular leaf in nature, but it partakes of the rounded lobes of the oak, Nos. 31 and 32, and

the celandine, No. 4; and when again subdivided it becomes like the celery-leafed crowfoot, No. 35, but it certainly is not taken from the acanthus. The Romans seem to have been fond of soft and round-lobed foliage, rather than the sharp and prickly, which is the invariable character of the Greek. In the richer friezes of the Romans the divisions of the leaves are extremely like what we find in the chrysanthemum leaf.

The round-lobed leaf is found also in Romanesque work, as will be seen in the capitals from Canterbury Cathedral, Fig. 6. In some of these capitals it is also carried further, by being divided into distinct leaflets. The Byzantine foliage followed the sharp outline of the Greeks.

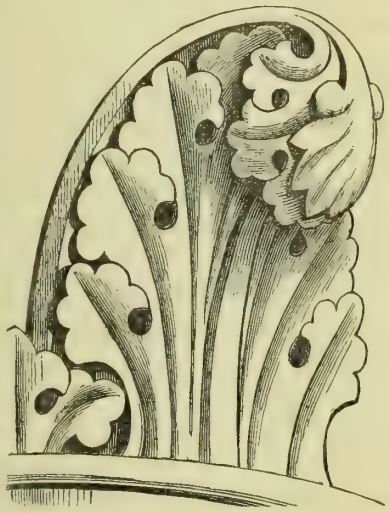


Fig. 6.

In studying the variety of leaves we find, as I have already shown, that nature works upon certain broad principles and sets out all her forms upon a plain and simple geometrical foundation. What is observed with regard to leaves will be found to be the rule with respect to flowers, but leaves may be sometimes substituted with advantage for petals. Variety of form may be also obtained by the introduction among foliage of insects, birds, animals and the human figure, which frequently give additional interest to the composition with the happiest result.

The light and shade of foliage is a matter of vast importance, and one that is seldom sufficiently considered. We can obtain also but partial assistance in this study from nature. Carvers usually overdo the shadows on the surface of leaves. If they are engaged upon Gothic work they will tumble the surface about like a sea in a storm, after the manner of the later Gothic carving, until all beauty of outline is lost. If it be a classical leaf they are working upon, they will groove and hollow it up until the whole surface is full of lines. In my working drawings I always indicate the modelling of the leaves, which I usually keep very simple, but it is very seldom that I can get the carver to adhere to the simplicity I aim at. When carving is placed upon a ground, as in a panel, the treatment of that ground in high relief is of the utmost importance. In low relief the carving depends more upon outline, and not so much upon light and shade, because such works are usually placed near the eye, but in high relief the case is very different: then the ground should be treated like the back-ground of a picture, and the darkest and most intense tones be produced by it; the highest and most brilliant lights should be obtained by the convex surfaces of the foliage, and the hollows be trusted to for the half tints. With this scale of light and shade between the darkest shadow of the ground and the brightest lights on the foliage the artist has to work much in the same manner as a painter would if he were painting in monochrome. It is, therefore, important how these are balanced and distributed. It is evident that if the shadows on the leaves are made too broad and deep, or too numerous, they must reduce the amount of light, and the value of the shadows on the ground will be destroyed, because they amalgamate with those on the surface.

The conventional treatment of architectural foliage depends more upon the skilful management of the light and shade than upon almost anything else. In adapting nature the forms of the leafage may be followed very closely, but its geometrical distribution and the treatment of the light and shade are the principal means of transforming it into conventionalized architectural ornament.

The amount of undercutting is another point which requires great consideration. Some carvers

take an infinity of trouble, and laboriously undercut every part—but this is a mistake. Some portions do not require to be undercut at all; they should be made to unite and melt away into the ground itself, in order to soften the edges of some of the deepest tones, and so to lose the outline of minor parts as to raise the value and sharpness of others. By this mode of partial undercutting, also, we see that the work is actually a part of the panel, and not laid in, as is still too common in wood carving. Where the work, however, is much raised from the ground it should invariably be undercut, so as to avoid thick, clumsy edges to the leaves.

We obtain many valuable hints for shadowing from the backs of natural leaves, as they are usually more convex than the fronts. The dried horse-chestnut leaf gives a very excellent suggestion for the raising the centre of the leaf surrounded by a hollow, which is often of great use in practice. Indeed it is remarkably similar to some of the moulding of the leafage in Gothic carving. The artist also requires to study the general balance of his light and shade, so that one is not too important for the other. As a general rule he usually errs by creating too much shade. He should remember that, in this country, we require strong contrasts, which can only be obtained by preserving brilliant lights in opposition to the shadows, and if the work is internal, as in a roof or groined ceiling, he can hardly make his light and shade too strong.

The nature of the material in which the enrichments are executed is another matter requiring thought. It is evident that a dull, heavy sandstone needs a very different treatment to a bright white crystalline marble; deal has to be handled differently from oak, and box, again, differently from either. I have found that square block carving has looked remarkably well in rough coarse-grained sandstone, and has the advantage of never getting clogged up with soot, as so often is the case in our large cities; and it always looks well when placed at a considerable height.

For great heights very little surface carving is necessary, and foliage will frequently look all the better for being left perfectly square and flat, after the manner of the square block carving, so as to give, according to the distance, the utmost value to the difference between the light and shade. What is crude and unfinished when near the eye will appear bright, sharp and sparkling when placed at the height for which a due calculation has been made for the effect intended to be produced. This is a matter of very great importance, but it is not sufficiently, and sometimes not at all, thought of. Immense labour may be often saved by properly considering this point when designing or carving ornament to be placed at a considerable elevation. One way in which the due amount of carving or intricacy of parts can be studied for various heights is this: Let the carver take his position on the ground in a position from which the enrichment can be best seen, after having set up a model at the height at which it is to be placed; let him then with a pencil, stretched at arm's length, mark off upon it the size of the enrichment as seen from that point. If he puts this size upon paper, and begins to sketch in all the parts of his ornament as he intends carving it, he will soon perceive what to omit. If the height be considerable he will find that he cannot draw in all the work, and that he can improve the sketch by omitting half, or perhaps three parts of it. What is necessary in the sketch will be a guide for what is necessary in the carving.

If for instance we take a portion of a parsley leaf, which in nature, as you all know, is a particularly complicated one, and we determine with this to fill a small triangular panel for a position near the level of the eye; we first of all decide upon the geometrical lines upon which it is to be set out, as I have before explained. In this case, these are simply the three lines branching from the centre to the angles of the triangle. We then proceed to follow the natural leaf in its number of divisions; but as we want to secure a greater amount of light on the surface than is possible upon the natural leaf, we give it a broader character, and adapt the outline to the form of

the space to be filled, as far as we may consider necessary for the effect we desire to produce. The three leaflets we make branch from a central flower, instead of flowing from a thin foot stalk. The flower of the parsley grows in clusters or bunches, consisting of a large number of florets, but each individual floret is very small and insignificant in itself. This mode of flowering is therefore represented by a central cluster of florets, although they are here necessarily reduced to seven, instead of showing a large and indefinite number, yet the principle is the same as in the natural example. This bunch of florets is made of a globular form, so as to form the principal light, and the centre of each leaflet is hollowed into a slight concave surface to produce the half tints, from the boundary of which the lobes flow towards their extremities with a gradual hollow curve. There is a very slight channeling of the lobes from their mid-ribs as well, but only sufficient to give a softened tone to the shades. The greatest amount and the deepest shadow is obtained from the ground, which should be of a deep convex section, so as to place the enrichment in a kind of basin.

If further simplicity be necessary for the panel from its being placed at a greater height from the eye, the leaf may be reduced in the number of its divisions, and the ribs omitted altogether, yet retaining the principle of the parsley leaf, and the light and shade may be kept the same as before. If it be necessary to carry the reduction of parts still further, to suit a yet greater elevation, it may be again simplified, while retaining the same kind of light and shade. All three examples are equally taken from the parsley, and each strictly adheres to the natural law of simplification, as shown us by nature herself. In fact the leaves will be found of these more simple forms if the parsley be minutely examined while the leaves are in their young state. If nature simplifies her forms in this way we cannot be wrong in following her.

The principles upon which leaves are divided in nature are continually being intermingled, although the power of nature is so great that each individual plant retains its own characteristic form. Not so in art. After a considerable amount of practice, and study of nature, you will draw your leaves without immediate reference to nature; they will be in accordance with her laws, but one form will intermingle with another, until you will scarcely know yourself for what leaf you intend it. That, however, need not distress you, as your object is not to copy nature, but to work upon nature's laws. Thus your simple lilac leaf may become ternate as in the Hepatica, doubly ternate as in the creeping crowfoot, triply ternate as in the celery, until, when you desire it, you arrive at the intricacy of the parsley, which is still upon the triple principle of division. Nature carries out the principle even upon the same plant—as in the ivy—where the leaves next the flower are perfectly plain and undivided, the young leaves upon the leaf stems are ternate, which further develope in the older leaves into a pentagonal form, No. 20. The pentagonal principle is again carried on, from the ivy, through the maple which has subdivided lobes, the vine and hop serrated, the cinquefoil, No. 23, where it becomes five distinct leaflets, and to the horse-chestnut in which it arrives at seven leaflets. So that by adopting the principle you need not necessarily follow any particular or individual leaf. This was the mode the Greeks pursued with the acanthus leaf; they did not follow the leaf literally, but embraced the principle which commences with the vine, runs through the thistle, the holly and other sharp-lobed leaves.

One point more I must notice before concluding, and that is the foreshortening of finials and other objects when placed at a height on a building, and the necessity of proportioning them so that to the eye they appear of the desired height when in their elevated positions. Many sculptors, I am aware, do make proper allowance for this when executing statues to be placed on the parapets and pediments of lofty buildings, but it is seldom attended to for minor objects. Some of the early French finials are very ably proportioned in this respect, and I have an example, in which a due

allowance has been made for foreshortening, in a finial from the interior of the Lady Chapel at Ely. It is from the upper canopies, where it is placed at a considerable height. It is greatly elongated beyond the ordinary proportion; the berries above the lower range of leaves are raised, and stand clear above them. Although the modelling of the leaves is rather in excess, the ribs upon the surfaces are omitted. This elongation is not only observable in the finial, but also in the canopy itself, which is of a much more lofty proportion than any of those which are nearer the level of the eye.

In the finials to the canopies of an oak screen I have endeavoured to carry out the same principle, by arranging their height in accordance with the position they have to occupy. I have also opened them, so as to catch the light through the foliage, that they may not appear heavy. Where you have no ground, and the work is pierced, these piercings have to be considered as much as if the work were upon a ground, except that these openings are light, and the ground is dark. The light and shade of the carving must be in due proportion to the piercings.

I have now glanced rapidly at the inconsistent and improper mode of applying foliage to architecture by overlaying it upon the work; at the literal copying of nature in a purposeless way by collecting a variety of flowers and different kinds of fruit, and putting them together in an indiscriminate manner, as in festoons and pendants. I have proceeded to show, to the best of my ability, that there are ample opportunities for introducing foliage into architecture, and that there are abundant materials for the purpose of the artist in nature, which have never yet been in any great degree exhausted—that the source is a vast and boundless one, containing a never-ending variety of beautiful form. Nature, however, is so prolific, and, if I may use the expression, so wayward in her manner, that a mere glimpse at a few leaves or flowers, or a mere picking up of a natural form here and there, is worse than useless. It is her principles that we have to search for, and these are hidden under every variety of form and manner. We can no more detect her secrets by a mere casual examination of her outside form than a burglar can reach the contents of a strong room by merely examining the outward form of a lock. There is only one way, and that is to sit down patiently to draw one form after another, until we at length arrive at a complete scale of all nature's variety of form, of her regularity and irregularity, of her geometrical uniformity, and of her apparent utter want of plan or design in her manner of growth. We see that throughout all her works she never by any chance imitates herself—for no two leaves, even upon the same branch, were ever yet found precisely alike—and yet the same forms are continually running throughout nature, until we may almost imagine that nature does nothing more than reproduce herself, and the casual observer can see but little variety in all her forms. Nevertheless, there is more truth in the words of the poet than probably he himself knew when he said :—

> All nature is but art, unknown to thee;
> All chance, direction which thou canst not see;
> All discord, harmony not understood;
> All partial evil, universal good.

It will be discovered also that whether we examine natural forms in this country, or whether we obtain them from the most distant quarters of the earth, we can see nothing new, nothing fresh; but from whatever country we obtain them we find that nature is still at work upon her old forms. At one time on a gigantic scale, at another upon a microscopic one; but when we search below the surface we arrive at certain art-principles upon which nature works, and which alone are of any worth to the true artist.

DISCUSSION.

MATTHEW E. HADFIELD, *Fellow.*—I know that my friend Mr. Colling is master of his subject, and in a great deal of what he has said I concur; but the subject of architectural foliage is of so wide and general a character that I prefer not to enter upon it.

Professor KERR, *Fellow.*—Mr. Colling's study of foliage has been for many years known to us, and his works on that subject have been universally examined. In discussing this subject, I think we must admit it is one which is extremely difficult to reduce to anything like philosophy. Our friend has given us numerous examples exhibiting his patience of investigation markedly; but he has not professed, and I do not suppose he would like to profess, to have reduced his system of investigation to anything like its laws. He refers us to nature, and there he leaves us. At the same time it appears to me there are one or two considerations which, without wishing in the slightest degree to contradict Mr. Colling, one may dwell upon. One point is that of the scale of natural products which are to be imitated. It seems to me that if we grant the proposition that nature is to supply us with materials for our ornamentation, we must accept as part of that proposition the scale on which nature produces the objects which we are to imitate; so that, for example, if you take the parsley on one hand and the horse-chesnut on the other—or the dock leaf or the thistle leaf, which are among the larger objects of the kind—and then come down to the smaller leaves, such as the ordinary trefoil or clover, you will, I think, scarcely be at liberty to reduce or enlarge all these to one size; because of course you are proceeding upon the assumption that nature is perfect in her designs, and the scale of the design is obviously part of it. At the same time, I think Mr. Colling has very clearly made out that in natural foliage the same principles of formation may be seen at work on different scales; so that, if you recognize another doctrine of Mr. Colling's: namely, the propriety of conventionalizing everything according to circumstances, then he may tell us that by merely introducing this principle we have overcome all difficulties as regards the adaptation of natural products from one scale to another. There is one other point which struck me; and if I am obliged to aim at the philosophy of the matter, it is because Mr. Colling has scarcely left one anything else to do. If, for instance, we are to imitate nature in stone, how can we copy natural leaves to what I shall call a nicety in such a material? Does it not seem to be the fact that those forms which nature has dictated in the tissues of leaves of plants become inappropriate for reproduction in such a material as stone? There again, however, we shall no doubt be told that we may get over the difficulty by introducing the conventional element, which I admit fully. This brings me to the proposition which, it appears to me, is probably true of all this artistic foliage—and I call it not architectural, but architecturesque foliage, as being not merely part of the architectural design, but of the essence of the architecture—that conventional treatment is thus essential (in order to make nature architecturesque); so that, if I were carving in box or other fine wood, or in ivory, some matters of delicate ornamentation, I might copy nature exactly as I find it, whereas when I came to carve on an architectural subject something which should be of the essence of the architecture—architecturesque—then conventionalism must become essential to the philosophy of the matter. Thus, we find in the case of the Greeks—who I suppose will be admitted to have been masters of artistic conception and execution in every way—we find they universally conventionalized their foliage. With regard to the Romans, I am not disposed to say much: their great merit is that they imitated the Greeks,

and carried on the Greek system into a new world. But when we come to the Mediæval carvers—admitting as we are bound to do the exquisite nicety of their work, especially that of the thirteenth century—we see again that, even with a much more naturalistic impulse, they still conventionalized everything; so that their work, although it is more naturalistic than that of the Greeks, is still more conventional than the corresponding work of the present day. You will see, for example, at this moment, in the so-called Queen Anne style, that not only are those who aim at being masters of the style compelled to use the extremely fallacious swags and festoons of which Mr. Colling has spoken, but actually to develop them in red brick; which is a marvellous instance of what the human mind can be brought to do when once it has laid hold of a vicious principle. The lecturer, however, has gone on higher ground than this, and has suggested, if he has not laid down, principles of art with reference to architectural carving which must show us how futile are such carvings in a material like red brick for mere idle imitation. Mr. Colling may perhaps be asked to say a word on the introduction of the principles of architecturesque carving into terra-cotta work. I think he might be asked to say something about that in his reply, because I know he has studied the subject at large all his life. As Mr. Colling is, no doubt, well aware, there are two principles on which terra-cotta is allowed to be used. The one is the principle whereby it is taken from the mould, burnt in the kiln, and fixed as exactly as it was moulded. The other is the principle upon which it is sophisticated, trimmed, modified, improved, undercut or otherwise manipulated in the process of manufacture after it has come from the mould. Now these two principles seem to me to be suggestive of a decided artistic difference—a difference which may be found to prevail in the use of ornamentation of the same kind in other materials, such as plaster for instance where, I apprehend, cast and cut ornamentation, even in foliage, ought to be essentially different in character and in treatment. In the instance of terra-cotta, I say, we see the difference decidedly; but I should like to know whether our friend has turned his attention to the general distinction between cast ornamentation, as in plaster work foliage, which surely ought properly to be done on an entirely different principle from that which is carved in stone with the tool. I have listened with great pleasure, profit and interest to the discourse Mr. Colling has been good enough to give us; and I regard it as one of those discourses which we ought to esteem almost more than any other.

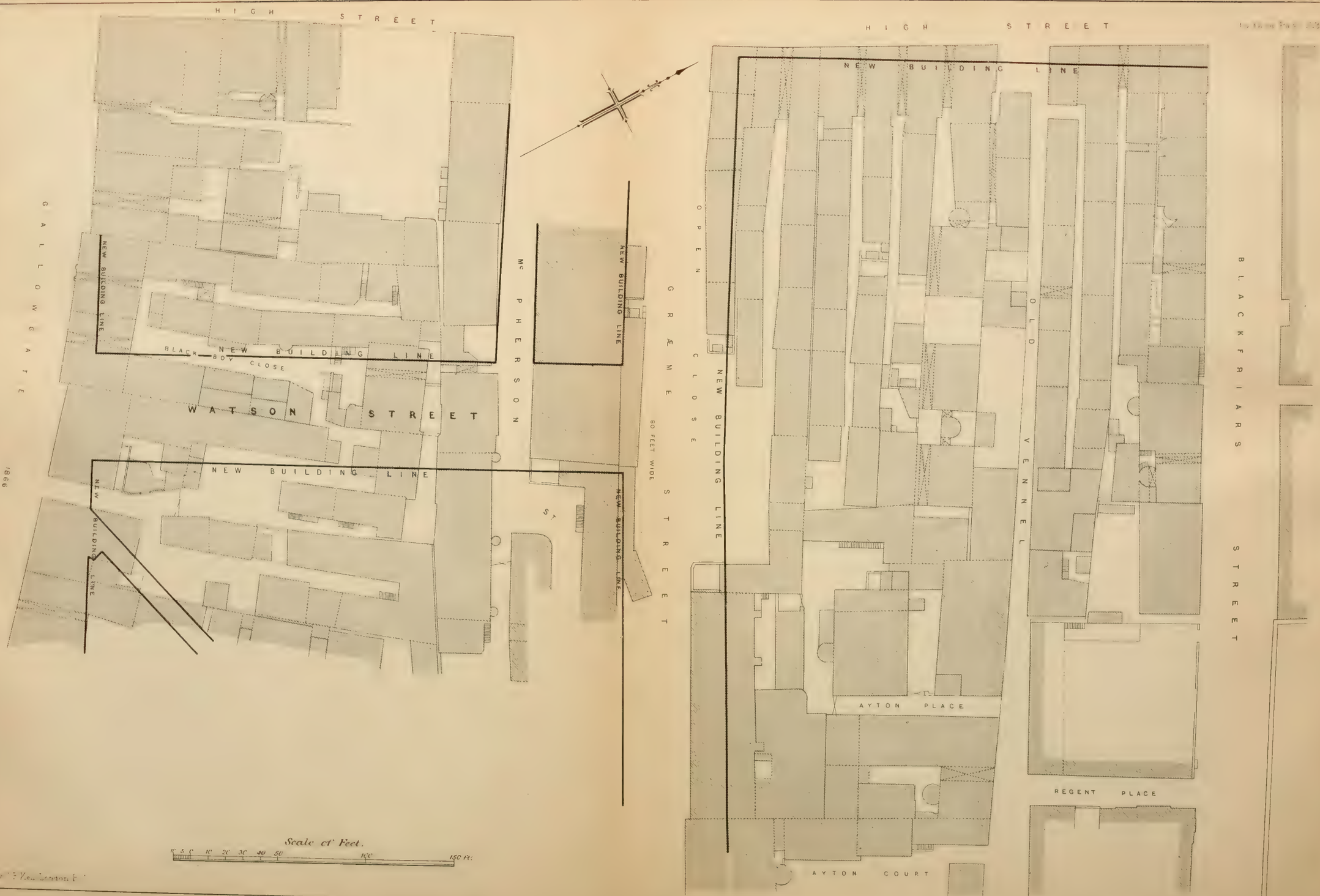
Lewis Solomon, *Associate.*—I should have liked to have heard more from Mr. Colling about foliage treated in the flat. There are some beautiful examples of Syrian and Egyptian work, in the flat, of leaves and flowers, and they form a most pleasing combination.

The President.—Mr. Colling's Paper has dealt with what may be called an architectural detail, an interesting one no doubt, but after all subordinate in the work which architects have to do. I think he will be quite ready to agree that it is subordinate, and that the first consideration of architects in their compositions should not be so much the superficial decoration—good or bad—placed upon them, as the general proportions and the proportions of the features and masses of which the design as a whole is composed. If these be unsatisfactory, nothing of carving or ornamentation will redeem a faulty architectural composition. Mr. Colling began his Paper with some remarks which I fancy may be somewhat misunderstood. He spoke of the modern European in terms rather of reproach—artistically—as carrying out his designs bare of all enrichment in the way of sculpture, and as trusting only to quirks, ogees and mouldings with which he composes his designs and surrounds their features. Now we have always been taught that the study of mouldings in cornices, string-courses, architraves and the like, and the perfection of refinement in these particulars, is that which distinguishes the man of taste from the man of no taste—which distinguishes the refinement of the Greek designs apart from any ornamentation from the stucco designs of the modern builder; and

therefore I, for one, place a great deal more value on the thorough study by the architect of those refinements possible on mouldings, and their proportion to the surface or openings they surround, than to any amount of carving that can be placed upon them. I do not suppose Mr. Colling meant to decry mouldings, but the opening sentences of his Paper seemed to bear that inference, which I am therefore anxious to see modified. That all carving of every nation and time, savage or civilised, has been based upon a study of natural forms may well be conceded, but the difference between one method of treatment and another is to be found, not only in the power to observe what nature shows, but also on the skill to reproduce what that observation has taught; and the power to observe and then reproduce is surely evidence of the difference between the cultivated and the uncultivated mind. We see in some cases the power to observe forms incorrectly rendered, as among savages and in very early times, while the power to observe and correctly render the result characterises those who are more instructed. The question of carving as an indication of natural powers of observation and reproduction is in itself an enormously large subject, treated exhaustively and illustrated from different nations at different epochs. Mr. Colling's Paper gives ample evidence of that observation and patient study of natural forms to which I have alluded, and I suppose there are but few amongst us who have given more thought, time and study than he in the attempt to systematise observations for the advantage of architectural ornamentation. I would venture, *pace* Professor Kerr, and *pace* Mr. Colling also, to make some little apology for the much-abused festoon. It does seem to me that those who think it ought to be apologised for can with some degree of truth say in answer to the criticisms passed upon it: What does a festoon represent in most of the positions in which it is placed? It certainly does not pretend to represent flowers growing, but flowers plucked and then added to otherwise bare surfaces; and you will remember that festoons are almost always placed as superficial decorations on buildings, friezes, panels and pediments, where you would hardly expect natural flowers to grow, but where on high or joyful occasions the use of plucked flowers is natural. There may be some consideration for those who have thought right to employ as a permanent form of decoration that which was originally introduced temporarily on festive occasions. I have felt, therefore, that some few words, it may be, of apology are due for the festoon. It is of course far from my intention to decry the good taste and general desire that has developed of late years for making carving more and more naturalistic and less conventional; at the same time I think I know some examples where that desire has run rather wild, and where nature has been so predominant and conventionalism has been so disguised that the architectural forms have been almost hidden; for too often carving alone has been relied on to satisfy the mind. But, on the contrary, I venture to believe that all decoration should be a secondary not a primary consideration.

James K. Colling, *Fellow.*—Professor Kerr has spoken about the scale of nature, and he has said that we ought not to make our work upon a larger scale than that of nature. But that is opposed to what I call true principles. The principle is to take what you like from nature, and make it upon a larger or smaller scale, or even to enlarge the smallest bit of nature. When I spoke of the parsley leaf I took only a small portion of the leaf, and I claim the right to enlarge that to any size I wish. If we go into a hot-house we see small leaves enlarged by nature. Why should not we do it? Besides, we are obliged to make our leaves larger or smaller to suit certain positions. We can make a leaf on a small scale when the work is to be near the eye; but if it is to be placed at a great height, we are obliged to make it of larger scale, or it would not be seen at all. We are not obliged to be confined to any scale in conventionalizing nature for architectural purposes. As to copying natural forms, I think it is a great mistake to fancy we are only to copy natural forms to a nicety. It is a wrong thing in work of this kind to copy nature to a nicety. I never do; and if you look at my drawings

you will find the hawthorn, the maple and others worked out differently, though the same leaf. It is much better not to adhere too closely to the form of Nature, but to adhere to the principles which you see there. That is what I call making a thing conventional: you make it of a form according to your more conventional idea. Every one has a certain way of working, and the way a man works is his conventional mode of working. The Greeks, as Professor Kerr said, conventionalised everything; I may not go so far as the Greeks, but I adapt the natural leaf as the form to be worked upon. Something was said about foliage in the flat; and though a great deal might be said about foliage in the flat—and most beautiful forms can be rendered in that way—I did not find it convenient in my Paper to go into it, and therefore I am not now prepared to enter upon that subject. The President has referred to my remarks about mouldings. What I mean to imply is that we see in some cases men give themselves up entirely to mouldings, whilst they specially omit all carving. I do not, however, wish to give foliage an undue prominence in architecture. I have at all times endeavoured to urge the absolute necessity for keeping it in its proper and subordinate position, without which foliage becomes simply a vulgar addition to architecture. There are modern examples of the Doric order—as in the case of the Euston Station—and other English examples, on which we never see any sculpture, the attention of the architect being mainly directed to mouldings. Again, one of my great objections to the festoon is that it represents, as it were, external decoration in direct imitation of nature. It has the character of Christmas decoration, and when you come to do that in stone you are imitating merely surface decoration. Decoration ought to form part of the architecture itself, which the festoon never can do, because it is a thing separate and put up afterwards, continually crossing mouldings and hiding the carving. Something has been said about carving from nature being carried to such an extent that it has run wild; but my reply is that it ought not to be allowed to do so, and that we ought to be able to manage nature without letting it run wild. As far as I know I have never objected to any conventional treatment of foliage. In my illustrations many examples of Greek and Roman conventional foliage are given, and I have conventionalised my own forms. What I object to is that in the present day we make use of Greek or Gothic, or Early-English conventional forms. In this I think we are wrong; for we should have our own conventionalism—the conventionalism of the present day, and not seek to resuscitate the conventionalism of past times.


HIGH STREET
GALLOWGATE
NEW BUILDING LINE
BLACK BOY CLOSE
WATSON STREET
NEW BUILDING LINE
NEW BUILDING LINE
Mc PHERSON ST.
NEW BUILDING LINE
GRAEME STREET
50 FEET WIDE
1866
HIGH STREET
NEW BUILDING LINE
OPEN CLOSE
NEW BUILDING LINE
OLD VENNEL
BLACKFRIARS STREET
AYTON PLACE
REGENT PLACE
AYTON COURT
Scale of Feet.
0 5 10 20 30 40 50 100 150 Ft.

ROYAL GEOGRAPHICAL SOCIETY
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MAP OF
A PART OF THE
CITY OF GLASGOW,
AT THE BEGINNING OF THE
PRESENT CENTURY.

Lith.d by C.F. Key London

VIII.—IMPROVEMENTS IN GLASGOW AND THE CITY IMPROVEMENT ACTS: ORIGIN OF THE ARTISANS DWELLINGS ACT.

By Sir James Watson, *Hon. Associate.*

It will be generally admitted that, if we would seek to elevate the great mass of our industrial population in our large cities throughout the kingdom, we must endeavour to provide them with comfortable dwellings. If the home of the working man be cheerless, dark and unwholesome, the result will naturally be to drive him to the use of intoxicating liquors and too often to the public house. With the view of obviating this, movements have been made both in Edinburgh and Glasgow, especially so in the latter; and the movements, although somewhat retarded by the too often injudicious conduct of the workmen themselves, with their strikes and trades unions, have been attended as I hope to show with beneficial results. Every stranger who visits Scotland must be struck with the difference existing between the dwellings of the humbler classes in Scotland as compared with those in England. In England they generally reside in self-contained brick buildings, whereas in Scotland they almost entirely live in large stone tenements divided into separate flats, with more than one family on each flat. But a still more striking contrast consists in the fact that a large number reside in *narrow lanes or closes* in the older parts of the principal towns in Scotland, and although many of these lanes have been removed there are still a considerable number inhabited by this class of the population. The old style of building was to erect large stone tenements fronting the street, with gardens behind, but as population increased, large blocks of houses came to be built on the site of these gardens, and stretching back as far as from 200 to 280 feet. Dividing these high tenements were narrow passages or closes of from three to four feet wide. This system of building long prevailed throughout the large towns of Scotland.

In a work published in 1736 giving a history of Glasgow, the author, Mr. McUre, after enumerating the eleven streets which then constituted the entire town, compares it to a comb with teeth on each side, the streets forming the centre or wood of the comb, and the teeth on each side representing the narrow lanes or closes. Maps published in 1776 and 1800 show that in the part of the city then built (and when the population amounted only to about forty thousand) this system then prevailed. On looking into this, one is tempted to inquire what could be the reason which induced parties, when ground was comparatively cheap, to resort to such a style of building. In all probability it was resorted to for protection during the troublous times which so long existed in Scotland, when families lived in masses to guard themselves from the raids of hostile clans or the oppression of the feudal barons. The map (see Plate 1) shows Glasgow in 1800. The early history of Glasgow is interesting. Originally it was a bishopric founded by David I. in 1120, who built a magnificent cathedral and richly endowed it. Houses gradually clustered around it; a university was founded in 1450, when the population amounted to 1500. As population increased ground rose in value, and builders, taking advantage of the old system and being without any Building Act to prevent them, filled up almost every inch of available ground in the centre of the city. The houses in these closes and lanes were long occupied by respectable people, but gradually deteriorated, and particularly so from and after 1847, by an influx of population from the rural districts of Ireland, bringing with them habits which, however innocuous among the open bogs of Ireland, were quite unsuited to the densely crowded parts of a large city. This class took possession of the closes, and

greatly increased the overcrowding. In some of these closes from 600 to 800 people came to be huddled together.

In 1866, when the Improvement Act passed, the density of the population in some parts of the city amounted in some cases to 600, and in others to about 1000 per acre. The state of things may easily be conceived under such circumstances. The houses in these closes were generally old, dark and ill-ventilated, without sufficient breathing space and without family accommodation, there being only one ash pit, &c., to each close—sometimes even for two closes—and when fever or small-pox broke out the results were appalling. The moral effect produced was not less disastrous. Many of the criminal classes took up their abode in them, driving away the more respectable. Scenes of riot and disorder, assault and robbery with violence, were of frequent occurrence, and in several cases murders were committed. Plans and sketches of some of these closes are given in Plates 2 & 3.

Such was the state of Glasgow when the Corporation, instigated by Mr. Blackie, then Lord Provost of the City, and Mr. Carrick, the City Architect, formed the design of applying to Parliament for power to purchase and pull down whole blocks of these buildings, to sweep away these narrow closes, to open streets through the most densely-populated portions of the city, and to see that in lieu of these old and wretched houses buildings should be erected, and vacant spaces arranged for, so as suitably to provide for the growing wants of the city. Plans were made with the necessary books of reference for the streets to be reformed and buildings to be taken down, and to every house scheduled notices were given and an Act of Parliament applied for. The area of overbuilt ground thus scheduled extended to 88 acres, being nearly the whole of the old town shewn in the map of 1800. The plans showed the formation of forty-five new streets or enlarged thoroughfares. Powers were sought to expend £1,250,000 on the purchase of these, and to take down, rebuild or sell in conformity with the plans of the new streets or enlarged thoroughfares. Powers were also sought to borrow money on security of the buildings, and to impose a tax on the rental of the city (to be paid by occupiers) of 6d. per £. for five years, and 3d. per £. for ten years. The Act passed almost without opposition in the Session of 1866. Immediately thereafter a committee was appointed, over which I presided, for the following six years. A tax of 6d. per £. was imposed for the first year, and a Bank credit for £45,000 was arranged for until the tax was collected and money borrowed on security of the trust. A judicious person (Mr. Lamb) was appointed to negotiate for the purchase of property privately, and as most of the buildings were old and dilapidated, and the owners willing to dispose of them, the committee succeeded in securing a considerable amount of property at very moderate rates. By the end of the first year they found themselves in possession of property to the extent of £50,512, obtained at from ten to fourteen years' purchase for dwellings, and eighteen to twenty years' purchase for shops. By this time loans began to come in freely at 4 per cent. The sixpenny tax, which had raised a great amount of dissatisfaction and grumbling, was reduced to fourpence for the second year, at which it continued for four years. The purchasing went on, and by the end of the second year a large amount of property had been secured. Such owners of property as were willing to deal at moderate prices had their property purchased, while those whose demands were exorbitant were left over. A rule was laid down that no great improvement should be begun in any one place which would enhance the value of the adjacent property until the whole buildings required for such improvement were purchased, and the adherence to this rule has tended much to the success of the enterprise. For the first two years nothing further was attempted than putting the dwellings into a fair state of repair, and opening up some of the long closes by the removal of a portion of the back buildings so as to secure sufficient breathing space, and playground for the children. The pressure of the sixpenny, and afterwards of the fourpenny tax, without the necessary changes being seen, gave

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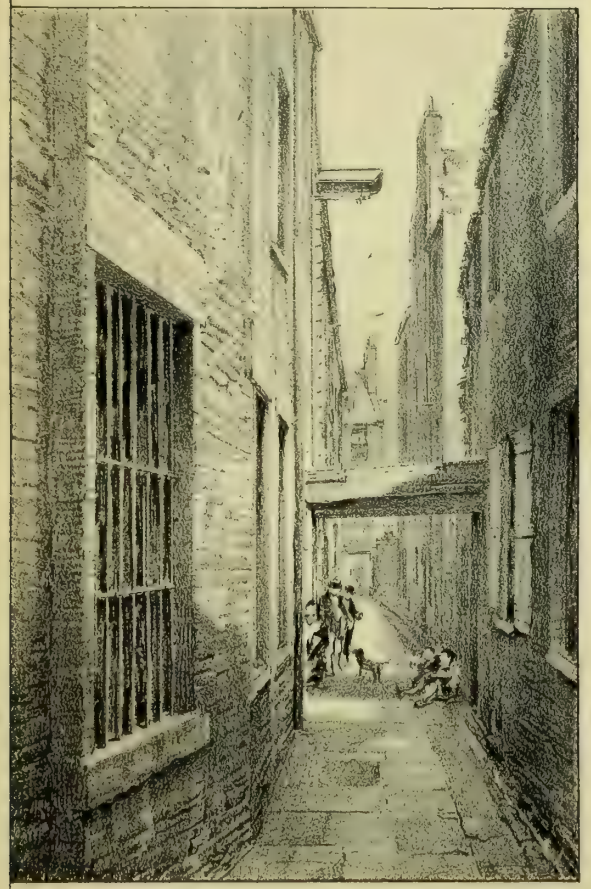

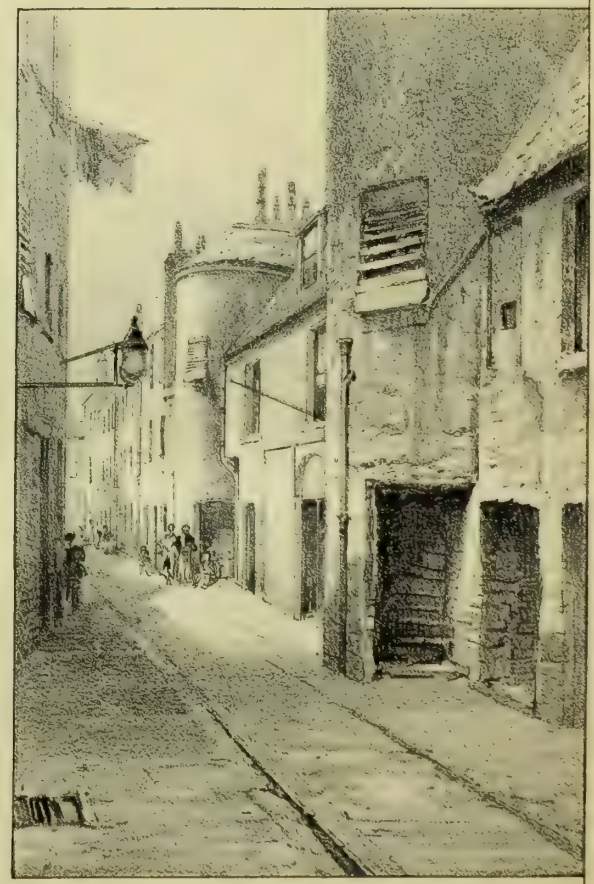

CLOSES OF OLD GLASGOW

Lith.d by J. F. Ross, London E.C.

ROYAL GEOGRAPHICAL SOCIETY
LONDON

rise to a regular crusade against the committee. We were represented as ruining the city, and told that the sooner our operations were stopped the better. At our quarterly meeting, however, we were enabled to explain everything, and the good sense of the public ultimately prevailed. The proceedings of the committee were narrowly watched by builders, and when they understood that large clearances were about to be made, and remembered how little had been done for years in the erection of workmen's houses, they immediately commenced operations. The rage for building workmen's houses went on from year to year, whole streets of new houses sprung up until the supply exceeded the demand. The committee, at first fearing that sufficient house accommodation might not be found for the displaced population, purchased two large lots of building ground in the vicinity, costing, including sewering and laying out of streets and squares, £80,661, to give off to builders for erecting workmen's houses at moderate rates. The plan succeeded and resulted in a profit of £15,000.

In about two years after the passing of the Act, commenced the demolition of some of the old and dilapidated buildings which had been purchased; such tenements as were dens of fever and disease, and haunts of the criminal classes, were taken down at once. This demolition process, however, required to be gradual, as it was necessary to prove to the sheriff before ejecting more than 500 persons of the labouring class that an equal amount of house accommodation suitable for such class existed or had been otherwise provided. In this, however, there was no difficulty, as the erection by private enterprise of the new went on much faster than the demolition of the old. The clearance thus effected by the committee, aided as it was by certain railway operations requiring similar treatment, had soon a marked effect on the health of the inhabitants, and particularly on that of the children, whereby the mortality was considerably lessened.

For the first four years the attention of the committee was chiefly occupied with the purchase of property and removals already alluded to. The rest of the property was put into a sufficient state of repair and let so as to secure a proper income. By 1870 the property secured amounted in value to £735,000, and the money expended to £764,063, and in 1871, £931,231. In 1871 the Act was extended five years, and in the same year the chief constable reported as follows:—"Through the operations of the City Improvement and the Union Railway, the city has been cleared of the foulest dens of profligacy and crime, and their occupants scattered among a population breathing a purer atmosphere, thereby affording facilities to the police for bringing the vicious to justice more easily and certainly than when the whole formed a concentrated and combined colony of ruffianism."* Fears were at one time entertained that the dispersion of the low class to other parts of the city might contaminate those places, but these fears were found to be groundless. On the contrary our sanitary inspectors have repeatedly reported that the condition of the displaced population has been improved, and that although paying higher rates for better houses in other districts they are satisfied of the advantages of the change.

About this period, 1871, the improvements began to be carried out by the sale of the ground with its buildings in order to carry out the plans laid down by the City Architect. Care was taken not to put much in the market at one time, and the prices obtained exceeded their expectations. In all cases the ground has been disposed of by public sale. The result of the committee's proceedings to the present time may be enumerated as follows:—

* Between the years 1867 and 1873 there was a diminution in the total cases of crime annually reported of 3030. Total cases reported to the Police in 1867, 10,899; in 1873, 7869—difference, 3030: and this in face of an increase of population of 57,453. Since then the numbers have fluctuated, but any increase is slight taking into account the increase in population.

	Property Bought and Paid for.	Ground Sold.
In 1872	985,159	124,307
„ 1873	1,087,365	180,762
„ 1874	1,241,353	513,112
„ 1875	1,315,008	565,136
„ 1876	1,431,593	774,091
„ 1877	1,487,362	883,634
„ 1878	1,538,971	921,538

The property has been all acquired by private negotiation, with the exception of three jury trials. The result of their operations has been to reconstruct large portions of the city (see Plate 2). Wide and handsome streets with spacious shops and dwellings have in many cases taken the place of narrow streets and lanes of old and dilapidated buildings. Narrow closes from whence the criminal classes were wont to issue nightly in quest of prey are now all but unknown, and respectable dwellings and warehouse premises have taken their place. Fever dens have been removed, and by aid of the Sanitary Committee the death-rate in these districts has been greatly reduced. The death-rate which was on an average 29 per 1000 in 1866, was reduced to 25 per 1000 in 1876, a saving of life in a population of 500,000 equal to 2000 annually. Last year the average was 26 per 1000 notwithstanding the unusually severe weather during the last months of the year. There are still, however, portions of the city requiring reconstruction, which are being attended to by the Commissioners.

It is difficult to give an adequate idea of the change produced in the various parts of the city by these operations. To do this we would require to have photographs of the old and narrow streets to contrast with those of the new; and as there are none of the former in existence, such contrast is impossible. In order, however, to give some slight notion of these changes, there is given, in Plate 4, a view of a portion of Main Street, Gorbals, as it existed before reconstruction; and in Plate 5 the same portion of the street after being reconstructed.

There is also shown, in Plate 6, a view of old houses in High Street still standing, but intended to be reconstructed; and on Plate 7 a view of new buildings in Gallowgate, erected on the site of the old. The change effected in this street by alteration of level, &c., is very great.

It is proper to mention that ground in the centre of the city was found to be too high in price to allow of the erection of workmen's houses. The buildings, therefore, which were erected there on the site of those pulled down, have consisted chiefly of shops and warehouses, along with dwellings for the middle classes. Those built for the working class have been erected at some distance from the centre of the city, where the sites were less costly.

The following letter, which I have received from Mr. White, our Assistant Master of Works, will explain the Plate No. 8, as an average specimen of the class of workmen's houses lately erected :—

"24*th March*, 1879.

"Dear Sir,—I send herewith two tracings. (See Plates 8 and 9.)

"Plate 8 is the plan of building erected by the Magistrates and Council in Warwick Street, which is 60 feet in width. It consists of four flats, each flat having two separate dwellings of two apartments and scullery. The arrangement is one of the best that exists; the apartments are large, the ceilings of good height—viz., 10 feet, and the height of the building 45 ft. 6 in. The free space requisite is three-fourths of this height, actually it is much greater, as the plan shows.

"Plate 9 is the plan of building erected in Dalmarnock Road, a street of 50 feet in width. The

N° 10 Plate 4 21st April, 1879

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Lith^d by C F Kell, London E C

MAIN STREET, GORBALS

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No 10 Plate 5 21st April 1879

to face Page 156

TRANSACTIONS OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

Lith^d by C F Kell London F^t

MAIN STREET, GORBALS.

ROYAL GEOGRAPHICAL SOCIETY
LONDON

N°10 Plate 6 21st April 1879

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OLD BUILDINGS, HIGH STREET

ROYAL GEOGRAPHICAL SOCIETY
LONDON

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Lith^d by C F Kell, London E.C.

GALLOWGATE, looking west to TRONGATE.

ROYAL GEOGRAPHICAL SOCIETY
LONDON

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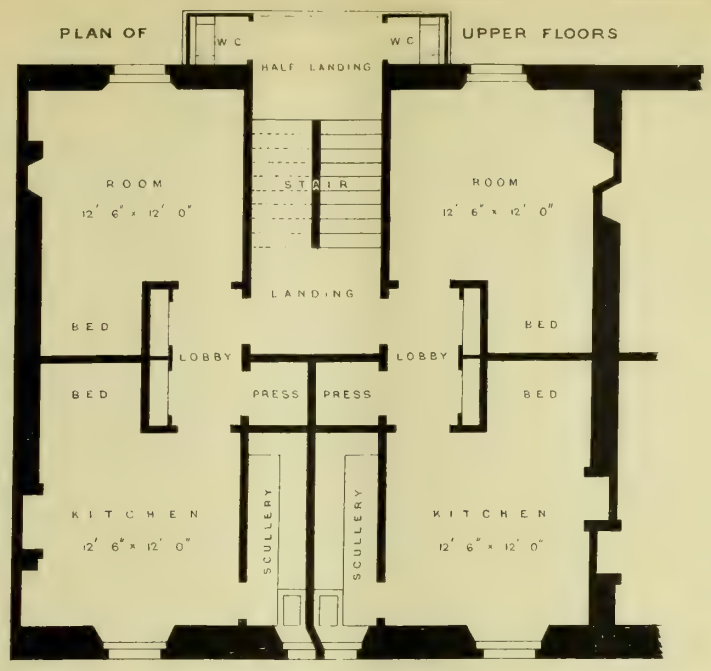
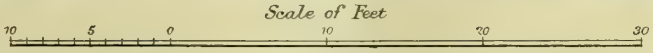
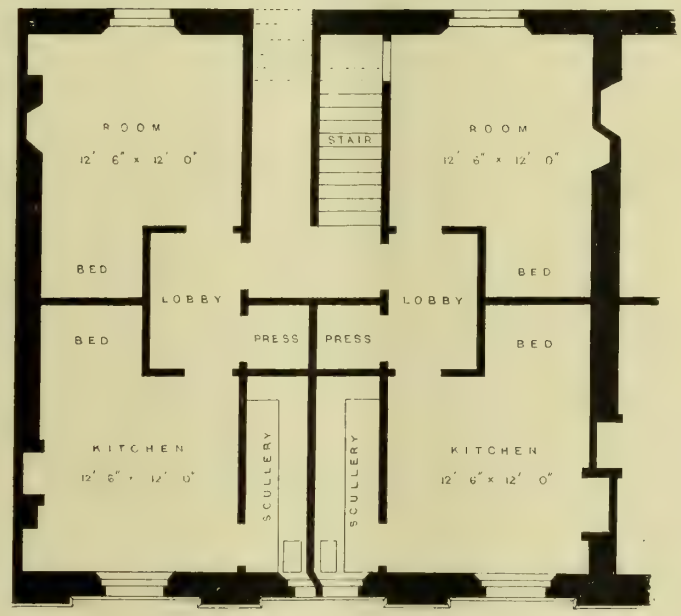
PLAN OF UPPER FLOORS

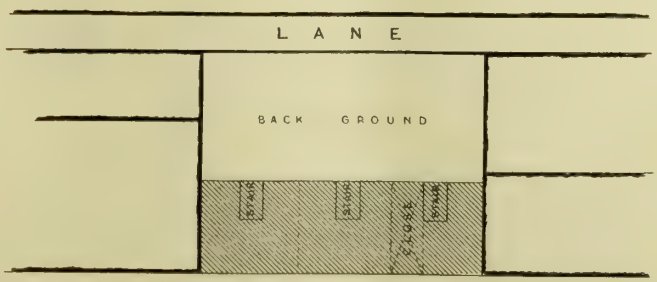


Scale of Feet





WARWICK STREET OR GROUND FLOOR PLAN. STREET



BLOCK PLAN

WARWICK ST

Erected by the MAGISTRATES & COUNCIL OF GLASGOW.

ROYAL GEOGRAPHICAL SOCIETY
LONDON

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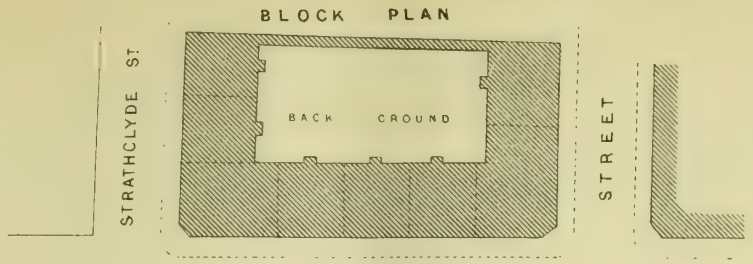
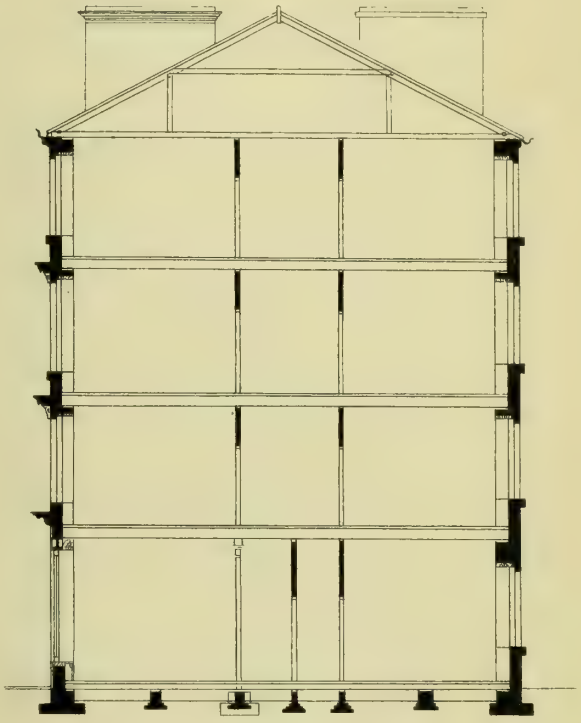
BLOCK PLAN



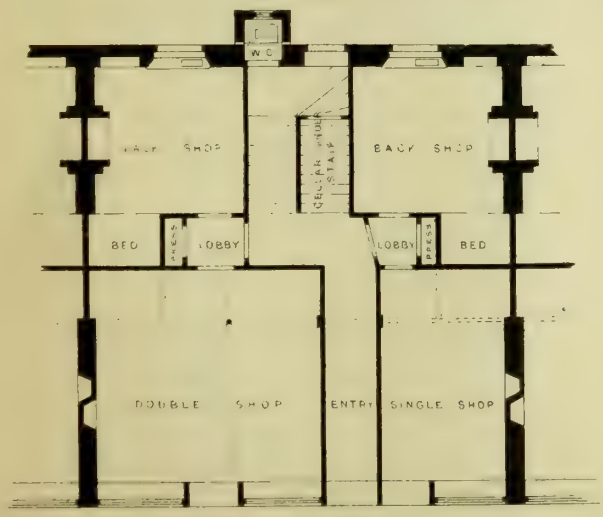
ELEVATION TO STREET



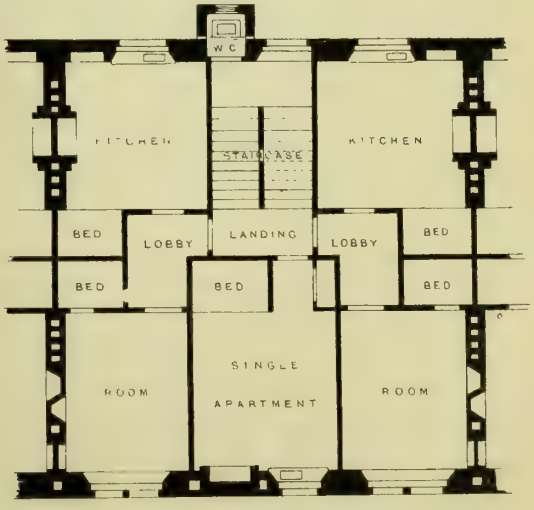
SECTION

Scale of Feet

10 5 0 10 20 30 40 50



PLAN OF STREET FLOOR



PLAN OF UPPER FLOORS

ROYAL GEOGRAPHICAL SOCIETY
LONDON

ground flat is occupied by two shops, each of which has at the back an apartment which may be used as a dwelling. The three upper flats have three separate family dwellings on each flat, two of them having two apartments, and the centre dwelling one apartment. The single apartment I do not approve of, my opinion being that there should be no separate dwelling of only one apartment. The height of the building is 45 feet, the ground flat having a height of 12 feet, the others of 10 feet. The free space necessary, in accordance with the Police Act, is three-fourths of the height.

"Notwithstanding the great care taken by the Court in examining plans to see that the arrangements for dwelling-houses are as complete as possible, in some instances it is rendered unavailing on account of houses, consisting of three and four or more apartments, and which, when the plans passed the Court, were shown as and intended to be occupied as one dwelling, being converted into single apartments. If the proprietors were bound to make application to the Court, it would not allow such alterations without sufficient means of ventilation being provided.

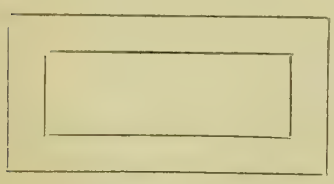
"I am, Sir, your obedient servant,

"Sir JAMES WATSON. (Signed) "JOHN WHITE."

It may be proper here to mention that, by a clause in the Glasgow Police Act, obtained in 1866, no building in which there are sleeping apartments is permitted to be erected, unless there be a free space in front of the window equal to at least three-fourths of the height of the wall in which it is placed. In streets formed since the passing of the Act, the width of the street must be equal to the height of the building. Where there are no sleeping apartments, it is in the discretion of the Court to allow the building to be higher than the width of the street by one-fourth.

In the old streets, however, formed previous to the passing of the Act, there is no such restriction as the width of the street regulating the height of the building. The consequence is that large tenements, in which there are no sleeping apartments, have been erected in several of our narrow streets, thereby excluding to a large extent the sunshine, air and light of heaven.

The restriction, as to the free space in front of and behind all buildings in which there are sleeping apartments, amounts on an average to about 30 feet of open ground. As far as the space in front of the building is concerned, it is well adhered to; but as regards the space behind, the Act is frequently evaded by parties who are proprietors on both sides of a square erecting tenements with a space of 30 feet between the buildings in place of 60 feet, which would be required if the buildings belonged to different parties. Thus the 30 feet is made to do double duty. This is felt to be particularly objectionable as regards what are called hollow squares, represented by the diagram, where, as they are closed on all sides, there is a total want of air circulation.



A very salutary regulation was introduced into the Police Act, requiring all apartments to be of such a size as to admit a certain amount of cubic feet of open space. The words of the Act are as follow, showing the difference in regard to houses built previous to the passing of the Act and those built subsequently:—

"If such dwelling-house consists of one apartment, and was used as a separate dwelling previous to the passing of the Act, unless it contains at least 700 cubic feet of space, or, if it was not so used, unless it contains at least 900 cubic feet of space.

"If such dwelling consists of only two apartments, and was used as a separate dwelling previous to the passing of the Act, unless it contains at least 1200 cubic feet of space, or, if it was not so used, unless it contains at least 1500 cubic feet of space.

"If such dwelling consists of only three apartments, and was used as a separate dwelling previous to the passing of the Act, unless it contains at least 1800 cubic feet of space, or, if it was not so used, unless it contains at least 2000 cubic feet of space."

This is exclusive of closets, presses and recesses not exceeding four feet in depth, and not having a separate window therein.

By a subsequent clause powers are given to persons appointed by the Board of Police from time to time to enter any dwelling-house which consists of not more than three apartments, for the purpose of measuring in cubic feet the space contained therein, and to mark on or over the outside of the door of any such dwelling-house (if the cubic contents thereof do not exceed 2000 feet), or to affix thereto a ticket on which are marked, in such position and style as the Board see fit, the number of such cubic feet, and the number of persons exceeding the age of eight years who, without a breach of the provision after-mentioned, may sleep therein.

This provision is, that when apartments are used for sleeping in by a greater number of persons than in the proportion of one person of the age of eight years or upwards for every 300 feet of space, or of one person of an age less than eight years for every 150 cubic feet of space contained therein, every person so using, or offering to be used, shall be liable to a penalty not exceeding five shillings a day during which it is so used.

For the enforcing of these regulations, a staff of sanitary inspectors is constantly employed; and, from the tickets placed on the doors, they are able to report all cases in which the requirements of the Act have not been complied with. The owners of the houses found offending are summoned before the Police Magistrate; are at first admonished and warned; and, if again found offending, a fine not exceeding ten shillings, or five days' imprisonment, is imposed.

The overcrowding which existed previous to the passing of this Act may be learned from the fact that, of 58,003 houses visited in 1866, the year the Act passed, no less than 4948 were found overcrowded; and such at that time was the scarcity of workmen's houses, that the police were unable to carry out their regulations with effect. The number summoned that year comprised, therefore, only those of a very aggravated nature: namely, 953. In 1847, the Superintendent of Police reported, in regard to the numbers living in lodging-houses of a low class, that, were he strictly to enforce the Lodging-House Regulations, he would turn out 6000 persons nightly to the streets. Since the Improvement Act came into operation, however, with the erection of whole streets of houses for the working classes, it will be seen by the following figures how greatly and gradually this overcrowding has decreased, although from the nature of the population it will always to a certain extent exist.

In 1871, the number of cases brought before the Police Court for overcrowding, after the magistrates began strictly to enforce the regulations, were,

In 1871	...	...	3143	In 1875	...	...	1623
1872	...	...	1741	1876	...	...	1446
1873	...	...	1162	1877	...	...	1247
1874	...	...	1540	1878	...	...	1141

Thus, in 1878, a year of great poverty and want of employment, the cases were not much more than a third of what they were in 1871. So much, I think, for the effect of the Improvement Act on overcrowding.

The regulations contained in the Police Act in regard to free space and size of apartments, along with others for securing sufficient ventilation and drainage, have tended so far to the improved sanitary condition of the city; but in this respect they are still found inadequate to cure the evils under which we suffer. An application has consequently been made to the Home Secretary for a provisional order giving additional powers. "If the public health is to be considered, application should be made (our authorities think) to the Court, and consent obtained before houses of four, five and six apartments can be reduced to houses of one or two apartments. The free space connected with buildings should be made what it was originally intended by the Act, and hollow squares should for the future be prevented. The cubic feet of space in the apartments of small houses should be enlarged, and all drains, soil-pipes and cesspools be constructed and ventilated to the satisfaction of the Dean of Guild Court and the Master of Works." This last is, I think, a matter of vital importance to the health of the community, as was shown in the case of Marlborough House and others, in which the drainage is so imperfect as constantly to give rise to gastric fever.

The Dean of Guild Court, to which everything connected with the erection and superintendence of buildings and formation of streets is referred, consists of the Dean of Guild as President of the Guildry or Merchantmen, along with three master-tradesmen sent by the Trades House, three merchants from the Merchants House, the Master of Works for the city, the Fiscal or Public Prosecutor and a legal Assessor. No building can be erected until the plans are submitted, examined and sanctioned by this Court; and all alterations affecting the exterior of any building must also, before being executed, pass this Court. A supervision is kept over all buildings in course of erection, and when buildings become dangerous they are required by the Court either to be rendered safe or taken down. The decision of the Court can only be appealed against to the Court of Session; and such is the care taken in these decisions that very few are ever appealed. This Court has proved of the greatest service to the community.

It is evident that no lasting benefit can be derived from Improvement Acts unless care be taken by sufficient building regulations to prevent the recurrence of such evils as these Acts are intended to remedy. In vain need we spend money to lessen the density of the population if builders are to be allowed to place erections on every available inch of ground; and in vain do we seek to improve the health and comfort and morality of the people unless we secure for them a free circulation of light and air. The effect arising from the want of such regulations is shown by the present state of the City of New York, in which it is stated that 500,000 people—nearly half the population of the city—are crushed into a density about double that of the most thickly populated districts of London, and nearly all the criminals that infest New York are there congregated. It is calculated that in that same city of New York there are 125,000 children under five years of age, only one in ten of whom reach the age of maturity.

We come now to enquire at what cost this has been effected. In a careful estimate made by me with the aid of Mr. Morrison, now the intelligent and able chairman of the committee, and Mr. Nicol, the City Accountant, we showed the whole cost of these improvements at 31st May, 1877, to amount to £178,462, arising from waste rents, interest of ground for a time unbuilt before being sold, parliamentary expenses, and expense of management. The result was made up as follows, viz.:—

Ground sold and on hand as valued	£1,647,332
Ground sold and paid for	1,612,504
Difference	£34,828

So that these pay for themselves.

There have been taxes raised	£283,462	
Taxes to be raised at 2d. per pound	80,000	
		£363,462
Deduct price of a public park	40,000	
Ground thrown into streets and open spaces, valued at	100,000	
Paving streets and construction of sewers ...	65,000	
		205,000
	Loss	£158,462
	Contingencies	20,000
The whole charge to the city		£178,462

On consulting with our City Architect as to the operations of the Trust since this estimate was made up, I find he considers that the present state of the Trust, if estimated at present, will still come very near what I have stated.

The last point to which I would allude is the manner in which the displaced population has been provided for. It has been shown by the chairman, Mr. Morrison, that during the first ten years after passing the Act, say until the middle of the year 1877, the population

displaced was		28,965
Add natural increase of population requiring accommodation, say 9000 annually for ten years		90,000
		118,965
To meet this there have been provided within the municipality	202,302	
Outside the municipality and within half-a-mile radius of the city, accommodation for at least	100,000	
		302,302
		183,337

Showing that the supply is far in excess of the demand by nearly 200,000. While this provided for all who were able to pay a moderate rent it entailed considerable hardship on a class belonging to a lower stratum—who lived in small houses and rented at £2 10s. to £3 per annum—such as widows with young children, old and infirm persons earning small wages, hawkers and single women, having the old Scotch independent spirit that they would rather starve than go into a workhouse. Accommodation has been found for these, namely :—

Firstly.—By a number of tradesmen vacating their old and removing into the newly built houses.

Secondly.—By converting large dwellings in the older parts of the city into single and double apartments.

Thirdly.—By the erection of Model Lodging Houses where parties, unable to keep a house, are provided with lodging, including fire, gas, and cooking utensils at 3½d. per night, or 1s. 9d. per week, —Sunday gratis—thus enabling them to live with more security and in a better atmosphere than in their old domiciles. As yet there has been no case of infectious disease.

There are now five of these houses belonging to the Trust and two more in course of erection. The cost of the whole is estimated at £80,000. They are all well frequented and are self-supporting. The construction is peculiar and well adapted for the purpose, as will be shown by the model now

exhibited. The benefit to those struggling to keep a house of their own, but unable to do so, has been found invaluable. A shop or store is attached to each house, where the inmates can procure such articles as they require and cook them in the large cooking hall of the house. There are also cooking depôts throughout the city where good food is supplied at very low rates.

The proceedings I have described attracted the notice of Mr. Cross, the Home Secretary, who requested information as to details. He afterwards visited the scene of these operations, and as the result he brought in and passed the Artisans Dwellings Bill, which promises if taken advantage of to be of great value to our large cities. It is deeply to be regretted, however, that so very few of them have as yet done so, although in many the reforms to which I have alluded are loudly called for. It is not for me to individualise these, but they must be known to many of the members of this Institute. The first that stands out prominently, as shown by Mr. McCullagh Torrens in an able article in *Macmillan's Magazine* for this month, is the City of London. In this article, after alluding to the frightful state of several districts, he points out with great force the necessity of restoring the Act of 1868 for the pulling down of old houses, &c. to what it was, as passed by the Commons, whereby power was to be given to municipal authorities to compensate the owner for the fair value under the Land Clauses Act, and to build workmen's dwellings with money borrowed at 4 per cent., charging it for a time upon the rates. This, however, should by no means supersede the putting in force of the Artisans Dwellings Act. Much is being done to educate the people, but I can conceive nothing more likely to frustrate such exertions than to have large masses driven into wretched dens and hovels from which an *emeute* in times of bad or political disaffection might be attended with serious consequences.

Reform in this is wanted alike for the comfort and morality as well as for the safety of the community, and more particularly for our artisans, for whom we all must wish that they should have cheerful and happy homes, where days of labour may be succeeded by evenings of peace and contentment, and where they can find that: "Be it ever so humble there is no place like home."

DISCUSSION.

THE PRESIDENT.—I think it will be the feeling of all present that Sir James Watson, in bringing this Paper before us, has touched upon a critical question of the day. I do not think there is any occasion for me to go into the necessity of operations in this direction being undertaken in London: of that we are too painfully aware. The most important question which is raised by Sir James Watson's Paper is—how to do it? how to solve the problem of pulling down the insufficient buildings which now exist, and replacing them by buildings better lighted, better ventilated and altogether healthier, at rents which the poorer classes can afford to pay. You are aware that many attempts to effect this have been made with more or less success. Building Societies have been started, some of which, it is true, have collapsed, though fortunately their places have been taken by other Societies, which are now engaged in carrying out the good work. But they do not pretend to house the poor. I think a great practical point—the interesting point of Sir James Watson's Paper is contained in its last pages, where he tells us of the attempt which has been made in Glasgow to build lodging-houses for the very poor. I have the pleasure to see here Sir Sydney Waterlow, whose name is connected with one of these movements, and I am sure he will be one of the first to tell you that to house the very poor is a matter of the greatest difficulty, and one which the Society he is associated with at last shrank from. They have not found any difficulty in housing artisans in the receipt of fair wages, and who can afford to pay a fair rent; but how to house the very poor at the small rent they can afford to pay, Sir Sydney Waterlow's Society has found to be a too difficult task to deal with, and that is really the problem before us now. I would therefore venture to suggest that gentlemen, who may address us on this subject this evening, will be doing the greatest service by directing their chief attention to that most difficult problem. In doing this the various points of difficulty which appear to suggest themselves are:—Firstly, the rate at which ground can be got; secondly, the inevitable cost of the building—dependent as that must be on the current price of labour—the outlay that must be consequently made, the cost of annual maintenance, rates, taxes, supervision and numerous outgoings; and thirdly, how these can be best economised to produce the greatest results. Before the discussion is closed, I shall take the liberty of asking Sir James Watson to give us a little further information on certain points, and at the outset I would express my strong opinion,—having had some personal experience in one of the Associations which have endeavoured to solve this problem—that in doing so great a work more help ought to be given by public agency than has hitherto been given, help for instance by the Metropolitan Board in fixing a very moderate price on the land to be appropriated. It would be to the interest of the community that they should let the land even gratuitously to secure buildings being put upon it, rather than put such a price upon it as does not give the slightest chance of building with success: because, while the price of land is an arbitrary matter, the cost of building in these days of labour is by no means an arbitrary matter, and is the one thing which cannot be controlled, while the price of land can be controlled. I think too the great water and gas companies should feel that they have a social duty to perform, inasmuch as they have a monopoly in these essentials, and that they ought not to charge these buildings on the same scale as they do ordinary buildings. If these principles were recognised in the quarters to which I have referred, there would be a fair chance of that success which is essential to meet the wants of the metropolis, and the community would feel a justification in this seeming sacrifice. The Glasgow

improvements, which have been introduced to our notice this evening, very clearly exemplify the benefits which result from enhancing the amount of light and ventilation in the formerly over-crowded portions of a great city. Sir James Watson has mentioned the name of Mr. McCullagh Torrens, who has given much attention to this subject, and I am happy to see him here. I do not know whether any of you have read the able article in the last number of *Macmillan's Magazine*, in which he not only deals with the considerations to which I have alluded, but he also points out how the Act of 1868 might be made, with essential modifications, of far more service than it is at present; it is as we know not quite a dead letter, but very nearly so.

Mr. McCullagh Torrens, M.P.—I did not expect to be called upon so early to say anything on this most important question, in the presence of gentlemen who are eminently qualified to teach me upon the subject; but as you have intimated your wish, I will venture briefly to say that, of the numerous public bodies to whom you justly appeal for sympathy and aid, I belong only to one; I am not a member of the Metropolitan Board, nor of any gas or water company, nor of any of the valuable Associations to which Sir Sydney Waterlow and others belong, and who voluntarily attempt the work of town rebuilding. It is however my lot to belong to another body which has some power,—that is to Parliament—and all that can be done by that body will, I still hope, be done with the object which you have in view. Sir Thomas Chambers, one of the representatives of the locality in which we are assembled, and Mr. Goldney the member for Chippenham, with whose assistance I wish to take the opportunity of saying the Act of 1868 was framed, have consented with myself to ask Parliament in this Session to reconsider the question which was then partly disposed of. It may not be known to all, but I hope I may without egotism remind you, that we succeeded in that year—now eleven years past—we succeeded in getting the House of Commons in that year, without a division, to pass a Bill for pulling down, compensating the owners and rebuilding; and I thought then and I think now, after eleven years' sad experience, that if we had been able to get such a Bill passed we should have been in a different plight to what we are now. With regard to Government action in the matter, I am bound to say, every minister I have had the opportunity of knowing is favourable to the giving us the facilities in London which the people of London require; happily we can say that the sentiments of the Monarch on the throne and those of the people are in harmony. I have much pleasure in meeting here to-night Sir James Watson, with whom I first became acquainted in that year, when he was in London endeavouring to carry out the same thing for Glasgow, and I remember how much information we gained from hearing what was contemplated being done in that city. They had the good luck to secure a separate Act for Glasgow; they have got what they wanted, and they have their reward. We in London only envy them. We are happy to see Sir James Watson bringing with him his sheaf of ripe corn, showing what good seed was there sown. Unhappily in that year there were two influential members of the House of Lords who thought they knew better than we did what London wanted, and they said, "If you get the power to pull down, clear away and put up the sites for sale, free trade will do all the rest." I almost went on my knees to Lord Westbury, to persuade him not to take from us the privilege of rebuilding. We asked the power also of compensating owners. He said, the owners were very well off if they got the old materials. I am neither an architect nor a builder, but I think I know what the value of the materials would be. Anyone who has done as I have done myself—gone through the worn out parts of the town—will find at the present moment acres upon acres of ground lying as bare as church-yards, where pulling down has gone on but rebuilding has not yet begun; and I leave it to all to judge what must be the terrible effect upon the minds of multitudes of men and women more closely packed than ever, looking daily and hourly upon the waste ground where formerly they had a refuge,

though a poor one. I ventured to say to the Home Secretary—as chief guardian, in the name of the Queen, of the safety, health and order of the metropolis—that I wished for nothing more than that he should, with his own eyes or through those of his inspectors, see how everything we have to apprehend, in the way of mischief and danger for the future, is being sown broad-cast; and as a representative for one of the largest divisions of the metropolis,—with the noble incentive of what we have heard from Sir James Watson of what has been done in Glasgow, while in London the facts are as we know them to be,—I would, as a member of one of those districts, beseech and implore the Government, for decency's sake, for morality's sake, not to allow another Session to pass without providing a remedy for this deplorable state of things. As to the Bill of Sir Thomas Chambers and myself, let them put it in the fire and welcome; if they will give us something more effective, we do not care about it. If it is not good enough, do something better; but do something. Do not let our people rot in misery, filth and degradation. I will tell the House of Commons such tales as shall astonish them. You have in every district a local, efficient and responsible body, if it be only clothed with sufficient power, whether it be the district board or vestry, I care not how, so long as provision is made for rebuilding our waste places; and I ask a body of men such as I now address, to bring their moral means and influence to bear upon the Legislature—by personal application on the subject or by petition—that another Session should not be allowed to pass without something more effective being done.

The PRESIDENT.—May I ask you to be good enough to explain two points to which you have referred. The first is, what is the nature of the amendment of the Act which you propose—whether, as I understand it, it gives power to local boards not only to pull down but to rebuild? The next point is as to the particular kind of machinery which would best exert itself upon the Government and the Legislature in this matter.

Mr. TORRENS.—With regard to the first question, when the Bill of 1868 was brought in, it vested the power to pull down and compensate and re-build in the vestries and local boards of the metropolis. The Act, as passed, retained that machinery. You will find the Act, as it now exists, vests that power, where no doubt it ought to be, in local boards. When we came to consider how we could get the House of Commons to review the actual state of things, it occurred to me that the best thing to do was to put upon the table the Bill as it passed the House, and to say, "This is not ours but yours." Accordingly we agreed to the principle of the Bill, as introduced into the House, but not as passed through committee. The House of Commons substituted the Metropolitan Board for the vestries, but the House of Lords set that right; accordingly we have the machinery as originally introduced, and I have had opportunity, during the last three months, of corresponding with the vestries, with the object of getting the Bill with the original machinery passed without curtailment, as it was originally drawn. You may take it that the Bill now before the House is identical with the Bill of 1868. With regard to the other question, I do not think I ought to venture in a public room like this to express any opinion of my own. I am not prepared to say how you could do it in your corporate capacity; but I apprehend there are few gentlemen present but must know some person or agency by which he could bring some influence to bear upon the Legislature, and men of both parties have co-operated in this matter. I would venture to throw out that, finding the Act ineffectual, in 1875 the Home Secretary introduced a Bill—and I wish to speak of his exertions with the greatest respect—for I am sure Mr. Cross meant to do his best, and the House of Commons took his advice, and passed the Bill without distinction of party feeling. But I felt then, as I feel now, that a measure which was admirable for street improvements is not adequate to meet all the wants of the case. In London you have great masses of population, not living merely in poor or crowded neighbourhoods,

but scattered over a large area. To meet these cases you must go on step by step, and as these places are pulled down by degrees, a moderately reasonable process of replacement should be going on as fast as you pull down. If there is one thing more than another which you cannot overcome, it is *vis inertia*, as displayed by the holders of houses. There is scarcely an employer of labour who does not set his face against the banishment of his workmen. A more cruel hypocrisy there never was than that of saying that the mass of working people can live out of town. There is no meaning or sense in saying that in such weather as we have had for the last six months a man should have to walk three or four miles to and from his work every day. What we have to do is to replace as fast as we displace—not to do too much, or do it everywhere at the same time—and have a machinery set up which shall always be at work. That is the object which we have in view.

Sir SYDNEY WATERLOW, M.P.—I came here hoping to learn a good deal that would help all those who take an interest in the improvement of dwellings in the difficulties of the present moment. It seems to me, after an experience of fifteen years, we have come to a dead-lock. First of all I feel I have learnt a good deal from the Paper which has been read to-night. Sir James Watson has given us a great many facts illustrating the causes which have led to the success of the Glasgow improvements, whilst we in London, who have worked so long at the same object, cannot claim to have attained the same amount of success as has been the case at Glasgow. I entirely agree with what my hon. friend, Mr. Torrens, has said with reference to the desolation of the waste spaces in and around our city. I have watched them myself for years. Many years ago I appealed to the Court of Common Council to try to do something with the waste spaces in connection with the Clerkenwell Improvement Act passed more than forty years ago, some of which Mr. Horace Jones will tell you are still unproductive. I endeavoured to point out that if the land had been let at a low rental or sold for a low price, and had been covered with buildings, the accumulation of the ground rent,—and what is of more importance, the amount of the local assessments—would have amounted to more than the highest price that could possibly be secured for the land at the present time. I am sorry that so many of those waste places still remain uncovered. It may be asked,—what is the cause of it? Under the Metropolitan Streets Improvement Act of 1872, eleven sites were set apart which were to be sold or let for the purpose of constructing houses for the working classes in the place of houses which had been taken down in carrying out that improvement. I think up to the present time only three of those sites have been let; two are in occupation, I believe, and the third will shortly be occupied. It may be asked, why are the others uncovered? Seven years have passed away, and it is several years since the land was cleared. The Board of Works put up these sites to let by tender; they spent money in advertising them; they gave every publicity to them that could be expected from a public body, and yet would not accept any of the tenders sent in to them, except the three referred to. It is, however, a curious fact that during all this time, the Society of which I have the honour to be Chairman, has been able to obtain from private owners all the land they wanted or could utilise at prices far less than was asked by the Metropolitan Board for the lands in question. The Metropolitan Board say they have a public duty to perform to protect the interests of the ratepayers; but I proved before Parliament, during the time we discussed the Artisans Dwellings Act, that the improvement on the assessment, consequent upon the construction of large blocks of model dwelling houses for the poor in place of the old houses taken down, was more than the whole price they put upon the land. In many cases the assessment is four or five times as much as it was before, and the profit on the assessment is profit to the particular vestries in which the land is situated. The Metropolitan Board contend that the increase in the local assessment is no advantage to them, but the Board is the aggregation of all

the vestries, and it is idle to say that Kensington is not benefited because Bethnal Green has been improved. The Board is throwing away the chance of covering the land with dwellings for the poor, and thus getting rid of the terrible picture which Mr. Torrens has presented to us so forcibly this evening. But Sir James Watson has told us that 30s. per superficial yard, or about 3s. 4d. per foot, is the highest price they could afford to pay for land for improved dwellings in Glasgow. I think I may say that is the minimum price I have had to pay, and in some cases I have paid the Board of Works twice as much; in other cases we have offered the Metropolitan Board twice as much as was charged by private landowners, but we were told it was not sufficient. I am, therefore, glad to appeal to such an authority as Sir James Watson as evidence that you cannot afford to pay more than 3s. 4d. per foot for the purchase of land for these purposes. In some places that would be an excessive price, because you may have to sacrifice half the land to prevent interference with light. But Sir James Watson has told us that they proceed in Glasgow in a manner we should all delight to see followed by the Board of Works in London under the Artisans Dwellings Act: namely, that demolitions should be made very gradually; and he has told us the new works have progressed faster than the old. I wish we could bring about that state of things here, and stop the demolitions until some of the evils complained of were abated. We should then be doing good work, for it is evident if you turn a large number of the working classes out of their houses, they must find places somewhere; and instead of the Artisans Dwellings Act lessening, I venture to say it has practically and materially increased, the difficulty of housing the poorer classes under proper sanitary arrangements. Another point Sir James Watson has referred to is one to which I would ask the particular attention of Mr. Vulliamy in connection with his large experience with the Board of Works. Sir James has told us that land allotted for workmen's dwellings in Glasgow is disposed of by public auction. That is what we ask for. How could the Board be blamed, if, having been directed by Parliament to clear away unhealthy districts, to remove houses and dispose of the land for building purposes—how can they be blamed if land is put up to public auction, even if it does not fetch the price it is considered it ought to fetch? Let them advertise the land in every possible way, and if that does not bring purchasers, let the land be sold by auction at the best market price—that is, the best price the market will afford. Who could blame a public body for doing that? They have a right to say, "This is not our own work, we are trustees of Parliament, and Parliament says we are to let or sell the land;" and I may take some credit to myself for having spoken of the necessity of using the difficult word "shall" instead of "may." I would have it plainly put, "shall let or sell." It is very difficult indeed, I think, to find reasons why the Metropolitan Board have not thought it right to take that course. I have looked round these walls at the plans Mr. Vulliamy has sent, and I find there are eleven areas to be cleared; how long will it be before those sites are covered with cheerful, well-ventilated houses? At present we cannot see the beginning of the end in this matter, but I do hope some good may arise from this discussion, and that some conclusion which seems to be right may be arrived at by those who have power and control in this matter. Sir James Watson has explained to us the model which is now on the table, describing the form in which model lodging-houses are built in Glasgow. Though it is the first time I have seen such a plan, speaking from the glance I have had of it,—and having heard that it succeeds,—I would commend it to some of our friends who have an opportunity of carrying out this work. The Society of which I am chairman has been at work for fifteen years, but we have never taken up that part of the subject, because we felt it required details of management which our arrangements do not permit, and which I am afraid under the existing Act we should not be in a position to carry out. But Sir James Watson told us the rent of

these rooms was 1s. 9d. per week, each having a separate entrance, and the use of a common room. I cannot see why that should not be made to pay, when we let two rooms and a scullery at Greenwich for 4s. 9d. per week. An important point has been raised in reference to the co-operation of public companies in promoting this work, particularly in the matters of the essential articles of water and gas. With regard to the former especially, I hope Parliament will step in and compel some better means of providing an adequate supply of water for the poor. My own experience is that the water companies have the matter far too much in their own hands. I have made great endeavours to obtain for our tenants (numbering some 16,000 persons) a constant water supply, by the construction of large tanks on the roof, filling them from the main and allowing the tenants to draw direct from them. If there is any complaint of waste of water, we can trace it to the particular tanks and find out who has been wasting the water. The way to obviate objections, on the part of the company, to constant supply, would be to take water by meter, and we have offered to adopt that method, paying the companies their own price per thousand gallons; but the largest company in London has objected to this arrangement. You are aware that though provision is made for constant water supply to small tenements, there is difficulty in carrying it out, because a constant supply cannot be given with imperfect fittings, and the adoption of it means the replacement of the whole of the fittings of small houses. I congratulate Sir James Watson and the municipality of Glasgow upon the work they have carried out, and the success they have achieved; and I do hope, in the course of a few years, we may be able to tell a better story with reference to the work of improving the poorer dwellings in our own city. There is one point of importance connected with the borrowing powers of public Societies engaged in the building of these dwellings. There is a Bill before the House which is down on the paper for to-night, by which it is proposed to alter the terms of repayment of borrowed money for these purposes. Societies may continue to borrow money at 4 per cent., but instead of being able to return it in the form in which we have been in the habit of returning it since we commenced to borrow about ten years ago: namely, by way of annuity or uniform annual sum payable every year—we shall be required to repay money borrowed, say for forty years, a 40th part and interest in the first year. If we borrow £1,000 for forty years at 4 per cent. repayable by way of annuity, the amount to be repaid each year amounts to £5 1s. We might, by good fortune and careful management, earn £5, £5 10s. or £5 15s. per cent.; if so, we would manage to pay £5 10s. very well. But Government say, "After the passing of this Act you shall pay back 1-30th of the principal and 4 per cent. on the £1,000 every year." The first payment on this plan will be £7 6s.; the next will be 2s. 8d. per cent. less, and so on—so that if the Bill is carried in the form in which it now stands, it will prevent the possibility of Societies like my own borrowing money under the Act of 1866, unless they are prepared to pay the first year's principal and interest at the rate of £7 6s. I hope, with the assistance of my friends in the House, to exempt the Labourers Dwellings Act of 1866 from the operation of that Bill, otherwise these wastes of land will remain uncovered still longer, and the time when there will be cheerful and healthy dwellings upon them will be still further off.

GEORGE VULLIAMY, *Member of Council.*—I heartily echo the congratulations to Sir James Watson upon the success which has been achieved in Glasgow. They seem to have much greater powers under their Act of Parliament than the Metropolitan Board of Works have, and greater facilities for the exercise of those powers. With regard to the eleven sites to which Sir Sydney Waterlow has referred resulting from the Act of 1872, he is very nearly correct, for out of the eleven only three or four have been let. Offers have been made by great capitalists to take the whole of the remainder at the prices fixed by the Board, but unfortunately when the time of sealing the contracts was

arrived at they failed to complete the purchase. Since that time we have had but few offers, and a great part of the land is still unlet. The Board are as anxious as Sir Sydney Waterlow to see this ground covered, but it would ill become me to question the principle of the Board's action with regard to the price set upon the land. They ask what they think right; if they do not get it, I suppose they may eventually put it up to auction. If my opinion were asked, I would advise its being put up to tender over and over again, and if that does not succeed to put it up to public auction. On the walls are placed the plans proposed under Mr. Cross's Artisans Dwellings Act, 1875; they were originally twenty-two in number, but they are reduced to seventeen. They are there shown in the way in which they are intended to be dealt with: namely, blocks of buildings with spaces of 30 feet between the blocks, which will be asphalted for children's playgrounds. With regard to the Whitechapel and Limehouse scheme, the whole of the property to the east of the railway has been cleared and tenders for letting the land are invited. Settlements are taking place with regard to the property to the west of the railway, but it is not proposed to dispossess the tenants until they can be accommodated elsewhere; nearly all interests in the property have been acquired. In the Bedfordbury scheme the final award of the arbitrator has been received by the Board; purchases are progressing and the question of the demolition of the property is being considered. In the Great Wild Street scheme the arbitrator has issued his provisional award, heard objections and the Board will shortly receive his final award. The Pear Tree Court, Clerkenwell, scheme is in the hands of the arbitrator, who will shortly issue his provisional award. In the Whitecross Street scheme Mr. Cross has appointed Sir Henry Hunt as the arbitrator. The High Street, Islington, scheme is in the hands of the arbitrator, who will shortly issue his provisional award. With regard to St. George the Martyr, Southwark: Elizabeth Place area; King Street area; and Mint Street area, the Board will shortly refer to the Home Secretary to appoint an arbitrator, but claims are now being dealt with. In the Old Pye Street, Westminster, scheme the arbitrator has issued his provisional award, heard objections and the Board received his final award on March 31st. In the Goulston Street, Whitechapel, scheme claims are in the course of settlement and negotiation by the Board. The Essex Road, Islington, scheme is in the hands of the Board; two special freehold claims have been settled and notices for the remainder of the claims will shortly issue. With respect to Bowman's Buildings, Marylebone, scheme, claims are now being received and reported upon. With respect to three other schemes, the Board are applying to Parliament for powers to carry them out. That is the present condition of things under the Artisans Dwellings Act, 1875.

CHARLES FOWLER, *Fellow.*—It will be interesting if Mr. Vulliamy can tell us whether in the price put upon these sites by the Board of Works they consider they are obliged to recoup the outlay.

GEORGE VULLIAMY, *Member of Council.*—It is hardly possible they can recoup themselves at the price which would be within the means of parties proposing to erect dwellings for the artisan class. The Board have only put such a price on the land as they are advised would allow of the erection of dwellings for the labouring classes. As trustees for the public they must get the best price they can.

CHARLES FOWLER, *Fellow.*—So that dwellings of this class must be partly provided at the expense of the ratepayers.

The PRESIDENT.—That is the intention of the Act: it is a question in what degree.

HORACE JONES, *Member of Council.*—All I can say on this subject has been better said by Sir Sydney Waterlow, but the fact hinges upon the special point of a more powerful body than even Parliament, that is to say, the love of an investor to get a fair return for his capital; and unless he gets something over 4 per cent. he considers it is not a fair return. Sir Sydney Waterlow has been so fortunate as to obtain sites purchasable at less price than the two sites which the City of London has at its disposal.

The price was about 6d. per foot per annum, and that is a price at which it will not pay to erect these dwellings; but the City was obliged to adopt these sites as a trusteeship and to administer the trust with some degree of justice to it, and a higher price than 6d. per foot could not be levied. One block pays from $4\frac{1}{4}$ to $4\frac{1}{2}$ per cent., while the other pays barely 4 per cent. We have heard from Sir Sydney Waterlow that the buildings with which he is connected pay fully 5 per cent., and if they can obtain ground at the reasonable rate which will enable them to do that they could get any amount of capital they like; and I have no doubt if a site could be obtained at a rate which would enable the investment to return say 5 per cent., you would be able to provide accommodation for the labouring classes. There are at present two sets of buildings in Farringdon Road, one set containing three rooms and the other two rooms. On the north side of Holborn there is another set, in addition to a block of buildings elsewhere for the accommodation of the married men in the City Police; these do not return anything like a fair percentage, but it was considered right to locate the married police in the City. If Mr. Vulliamy could persuade the Metropolitan Board to give the ground for next to nothing they would have plenty of people to build upon it suitable dwellings.

SCHEDULE.—Showing the position of the Metropolitan Board of Works with regard to the various Schemes under the Artisans Dwellings Act:—

1. *Whitechapel and Limehouse Scheme.*—The whole of the property to the east of the railway has been cleared, and tenders for letting the land are invited. Settlements are taking place with regard to the property to the west of the railway, but it is not proposed to dispossess the tenants until they can be accommodated elsewhere and the Board have acquired all interest in the property. 2. *Bedfordbury Scheme.*—The final award of the arbitrator has been received by the Board. Purchases are progressing, and the question of the demolition of the property is being considered. 3. *Great Wild Street Scheme.*—The arbitrator has issued his provisional award, heard objections, and the Board will shortly receive his final award. 4. *Pear Tree Court, Clerkenwell, Scheme.*—In the hands of the arbitrator, who will shortly issue his provisional award. 5. *Whitecross Street Scheme.*—The Home Secretary has appointed Sir Henry Hunt as the arbitrator in this scheme. 6. *High Street, Islington, Scheme.*—In the hands of the arbitrator, who will shortly issue his provisional award. *St. George the Martyr, Southwark, Scheme:* 7. Elizabeth Place Area; 8. King Street Area; 9. Mint Street Area.—The Board will shortly refer to the Home Secretary to appoint an arbitrator, but claims are now being dealt with. 10, *Old Pye Street, Westminster, Scheme.*—The arbitrator has issued his provisional award, heard objections, and the Board has received his final award. 11. *Goulston Street, Whitechapel, Scheme.*—Claims in course of settlement and negociation by the Board. 12. *Flower and Dean Street, Whitechapel, Scheme.*—Claims in course of settlement and negociation by the Board. 13. *Essex Road, Islington, Scheme.*—In the hands of the Board. Two special freehold claims have been settled, and notices for the remainder of the claims will shortly issue. 14. *Bowman's Buildings, Marylebone, Scheme.*—Claims are now being received and reported on. 15. *Wells Street, Poplar, Scheme;* 16. *Little Coram Street Scheme;* 17. *Great Peter Street, Westminster, Scheme.*—The Board are applying to Parliament for powers to carry out these three schemes.

*** The above numbers, attached to each scheme, correspond to the plans presented by the Metropolitan Board of Works, and now in the Institute Library.

ADJOURNED DISCUSSION.

THE PRESIDENT.—On turning back to Sir James Watson's Paper a number of questions have suggested themselves to me, and I do not think I can do better, in opening the proceedings to-night, than to call his attention to a few difficulties which have occurred to me, and no doubt to some present, which his Paper seems to suggest. Sir James Watson told us in the first place with reference to the price of ground, that they found it did not pay to erect houses of this class in Glasgow on ground at a higher cost than 30s. per yard, or 3s. 4d. per foot super., which if valued at twenty-five years' purchase will bring the annual rent to about 1½d. per foot. The questions which I wish to bring forward have reference principally to the latter portion of the Paper: namely, the lodging houses for the extreme poor. That is the great social question in London at the present time, and if that is one which the Glasgow people have solved satisfactorily it will be of interest to us. I would ask Sir James Watson if he can tell us (and possibly Mr. Honeyman who is so well acquainted with Glasgow may be able to supply such information as Sir James cannot give) what the cost of annual maintenance is in proportion to the gross rents received—in other words, what are the annual outgoings, and what is therefore the percentage on the rents which, on an average, they engross? Then I would ask him at what percentage he places the loss on empties (unoccupied apartments) in the course of the year, because that may occur in a greater or less degree in different localities? Then I would ask him how they deal with damages done by tenants—whether the tenants are able to be made responsible for them, and how or whether they go as part of the outlay? What the mode of resident supervision is of each block, and the cost of the same per annum, also in proportion to the rent? Whether the construction of the buildings is fireproof or not? In one part of his Paper Sir James Watson mentions the density of population in Glasgow to be from 600 to 1,000 per acre; now I do not think Sir James Watson told us what was the annual product of the city tax, which commenced at 6d. and was afterwards reduced to 4d. in the pound—what it produced when it was 6d. and when it was 4d.? I would desire to compare that rate in aid of the expenditure needed for the carrying out the scheme, and see what amount Parliament enabled Glasgow to give itself, for Parliament has not allowed London as yet to give itself any rate in aid at all. On p. 155 of the Paper Sir James Watson says: "The committee, at first fearing that sufficient house accommodation might not be found for the displaced population, purchased two large lots of building ground in the vicinity, costing, including sewering and laying out of streets and squares, £80,661, to give off to builders for erecting workmen's houses at moderate rates. The plan succeeded and resulted in a profit of £15,000." I wish to ask at what rate of rent per foot were those plots offered to builders. On p. 157 he mentions the cubical area which the Glasgow authorities consider necessary for an apartment whether single or in sets of one, two or three rooms, but it was not clearly stated what is the cubical area, per individual, thought necessary. I think he says on p. 158 that that was roughly estimated at 300 cubic feet for adults and 150 for children, but also that the authorities thought that insufficient. On that I would ask what power of control any authority (and what authority) has upon that very important matter? whether they have the power of turning out occupants who overcrowd apartments, and if they can point out any practical mode of control? That is one of the great difficulties we find in London. In accepting tenants in the various

lodging-houses built or building in London great care is generally taken when a man first enters as a tenant—a married man with two or three children—that he shall have in proportion to the number of individuals the cubical feet of air he ought to have, but unfortunately a baby comes, and that adds one more; and then the children grow beyond eight years of age and get from children to adults. Are they to be turned out because they are adults, or because another child is born, and if not what course can be taken to prevent the overcrowding? I have thrown out these suggestions in order to lead the debate. In my experience I have met with these difficulties, and if Sir James Watson is able to solve them, or any of them, I for one shall be much obliged to him.

Sir JAMES WATSON, *Hon. Associate.*—I shall have great pleasure in giving all the information I can with regard to the questions the President has put. With regard to the rate for ground at which we thought the dwellings for working classes would be erected, I mentioned in my Paper that it was considered by builders in Glasgow it would not pay unless they were able to procure the ground at 30s. per square yard. I may say builders in Glasgow consider buildings of this kind ought to pay not less than $6\frac{1}{2}$ to 7 per cent., and this calculation of 30s. per square yard is upon the understanding that they would be able to make a return of that kind. There have been cases where they have paid 40s. per square yard in some particular parts of the town where they expect to make proper rents. The next question is the cost of annual maintenance in proportion to the gross rents. That I am unable to answer for this reason: The Improvement Trust with which I was connected purchased the houses, pulled them down, and sold the sites. These were purchased by the builders who erected the houses for the working classes. We had nothing to do with them after selling the ground. The proportion of empties to the whole number built I am unable to answer. Of course this must partly depend upon the particular locality in which they are placed, and very much upon the state of trade, but we have generally found that wherever houses of that kind were erected they were occupied immediately. The next question is—how we deal with damages done by tenants? That is a matter with which the Improvement Trust had nothing to do, and they have had no claims for damages. The next is as to the mode of supervision of each block—how it is done? I am not aware of any private supervision over such blocks. But as to the model lodging-houses there is a general superintendent who has a staff under him, and the whole management of the lodging-houses is placed in his hands. The regulations are posted up in the public hall of the building, and it is the duty of the superintendent to see they that are carried out. The time for opening and closing the house is fixed. The superintendent receives the money from the lodgers over night, and everything is conducted with the greatest regularity.

The PRESIDENT.—What does such a staff as you mention cost in proportion to the rents received?

Sir JAMES WATSON, *Hon. Associate.*—We pay the superintendent 25s. a week and the men under him 15s. or 16s. In houses accommodating 300 lodgers we have a superintendent and three or four warders residing in the house. The next question is whether the floors of these houses are made fireproof? I cannot say they are fireproof. We think there is no building fireproof. The walls are of stone 2 feet thick, and we consider them as safe in respect to fire as ordinary dwelling-houses. The beams, joists and floorings are of wood. The next question is—what is the product of a sixpenny rate and a fourpenny rate tax on the community respectively? A penny in the pound produces £9,000 or £10,000, consequently a sixpenny levy produces £60,000, and a fourpenny £40,000. The next point is—what control is exercised over these lodging-houses in restricting them to the defined number of individuals so that they shall not be overcrowded again? We leave that very much to a body of directors who visit the houses weekly, and it is almost impossible to

overcrowd them, because though every bed is occupied there can be no overcrowding. As regards all houses in the lower parts of the town we have a class of inspectors who make the rounds every night from one district to another. They have power under the Police Act of going into any house where there are not more than three apartments, and they make their reports. From the tickets at door they know what number of occupants there should be in the house, and where overcrowding exists they report accordingly to the police. They are engaged on this work from eleven at night till three in the morning. With regard to fines great consideration is shown by the magistrates to poor people where the overcrowding arises simply from the members of their own families. But in Glasgow we have a great number of Irish who take small houses and crowd them with lodgers ; these are warned in the first instance, and if they repeat the offence they are fined or imprisoned.

The PRESIDENT.—As far as families are concerned you leave them very much to find out when they become too crowded, and to seek larger apartments. There is one matter which I omitted to notice, and that is the price per cubic foot which these buildings cost.

Sir JAMES WATSON, *Hon. Associate.*—I must leave that to be answered by my friend, Mr. Honeyman. I should like to say that these model lodging-houses have been a source of great advantage to the community, and have paid extremely well. I was at one time connected with an Association which established three lodging-houses—two for males and one for females. This was many years ago. We bought the sites as cheaply as we could, and we erected first one house, and then a very large house to accommodate 320 males and 150 female lodgers. We went on year by year charging the same rent, 3d. per night, or 1s. 6d. per week, Sunday being gratuitous. For this the lodgers had the benefit of a comfortable bed, soap and towels for washing, the use of cooking utensils, a reading room supplied with books and newspapers, and lectures were occasionally delivered in the house. The houses were always filled, generally to overflowing, and the result was that at the end of thirty years we were enabled to pay the parties who contributed the funds five per cent. during the whole period except for the first three or four years. The back payment was afterwards made, and we realised an accumulated profit of between £16,000 and £18,000, which was handed over to the Royal Infirmary. This arose partly from the circumstance that the land was purchased in the lowest portion of the town. It formed altogether a somewhat large estate, and about half the £16,000 was realised by the re-sale of the surplus land. I have no doubt lodging-houses of this kind properly managed will pay exceedingly well, and if erected in some of the poorer localities would prove an important boon to such localities.

JOHN HONEYMAN, *Member of Council.*—I am extremely sorry that I am unable to answer satisfactorily the questions which Sir James Watson has referred to me, as I have had no professional experience in connection with this class of buildings, and such information as I have on the points referred to has been gained from others ; but it may prevent confusion if I explain that the Corporation of Glasgow have not erected model dwellings for the occupation of families, but only model lodgings for single men and women. The statistics of these could easily be obtained, and would be interesting in themselves, but they would be useless for comparison with the statistics of the improved dwellings recently erected by different Associations in London. We have nothing of the kind. I would add one or two remarks with reference to the matters brought before us, and in doing so I must confine myself to the somewhat ungracious task of fault finding, but the spirit in which I do so will not, I am sure, be misunderstood by Sir James Watson or anybody else. I may first mention a circumstance of some interest to such an audience as this: namely, that when the Act was obtained the Town Council —although they had an excellent scheme prepared by Mr. Carrick, the City Architect—requested five of the architects of Glasgow to give separately their professional opinions as to how the areas should

be opened up by new or widened streets, to what extent, and with what kind of buildings the vacant ground should be occupied. I mention this because I think it an example worthy of imitation by other public bodies in similar circumstances. Amongst others, I had the honour of being asked to give my ideas, and I then took occasion to express an opinion which all future experience and observation has strongly confirmed, that one of the greatest possible benefits of the improvement scheme would be missed if it were not carried out in such a way as to ensure that a considerable portion of the cleared areas should be occupied by dwellings for the very poorest classes. Now I venture to think that object has not been gained, and so far as the solution of that difficult problem is concerned—the providing of dwellings for the poorest classes in the central districts of a city—we can get no enlightenment from what has been done in Glasgow. The policy of the Improvement Trustees has been to disperse the population to the suburbs. A good deal might be said in favour of that for certain classes of artisans, but generally it is a great mistake in my opinion. The working population should, if possible, be concentrated near the works or warehouses where they are engaged, otherwise the workmen and their families are exposed to great inconvenience and expenses which they can ill afford. This policy of dispersal has no doubt had its origin in mistaken ideas with regard to the effects upon health of density of population. It is obvious that in such vile closes as Sir James Watson has described, where huge tenements have been erected on each side of narrow lanes, not more than from four to seven feet wide, without the slightest regard to sanitary requirements, the density of population will infallibly be accompanied by an extremely high death-rate; but on the other hand, there is no necessary connection between the two things. If streets and courts are properly arranged, and if buildings are properly planned, properly built and properly attended to, we know from practical experience, through the operations of several Associations in London, that greater density of population than existed in the very worst districts of Glasgow is not incompatible with most healthy conditions, and a death-rate considerably below the average of the city. The great thing to encourage is the erection of healthy houses with cheap rents for the poorest classes in the most convenient situation for their work. That would confer the greatest benefit upon them and upon the whole community. The President has suggested that certain concessions might perhaps be looked for in aid of this movement from the great gas and water companies, but I fear that can hardly be expected. In Glasgow, however, where the legislature has allowed the Corporation to be proprietors both of gas and water something of the kind might reasonably be looked for. I cannot see that it is the right thing for a corporation to do—to build these houses themselves with the rates which they levy upon the community. They would gain their object by other means, for example by reducing the price of the land and making a reduction—even if it seemed a loss—in other things; if private enterprise could be stimulated to supply the want it would be better. The testimony of builders with whom I have conversed on the subject is that it is not worth while to build upon land which costs more than 30s. per square yard; therefore those men will never build upon these central areas that have been cleared unless the land can be obtained at or under that price, and the serious question for such a body as the Improvement Trustees of Glasgow to consider is, whether it would not be better in the interests of the community to reduce the price and so give an incentive to builders to cover the ground with the kind of buildings which are so much wanted. In leading thoroughfares altered by the trustees, the land has been sold at as much as £20 the square yard, and even more, and no one can object to that; plenty remains of less value. There is another point I think it right to mention in connection with this: If the Corporation do not see their way to give direct encouragement to builders, they ought at least to abstain from discouraging them by imposing unnecessary restrictions on domestic buildings. There are one or two very costly restrictions which

affect buildings in Glasgow, and in the proposed provisional order which Sir James Watson referred to in his Paper power is sought to impose more. For example—it is proposed to prohibit hollow squares, however ample the ventilation of the centre may be, to require passages leading to stairs to be not less than five feet wide, and no stair less than four feet six wide, and to prohibit the use of rooms for dwellings which have not ceilings at least ten feet high. I should like to know how such an Association as that with which Sir Sydney Waterlow is connected would be likely to pay if hampered by such restrictions as these? The effect of such vexatious and unnecessary restrictions should be seriously considered by a corporation desirous of encouraging builders to put up dwellings for the poorest classes. Upon the whole I fear it must be admitted that in Glasgow we have not as yet succeeded in solving the difficulty at all. These model lodging-houses are most excellent in their way, but they do not provide for the great want of the time: namely, dwellings for the poorest classes of the community.

MATTHEW WYATT, *Fellow.*—I have only one question to ask Sir James Watson. It appears to me it is an undoubted fact that land for these purposes is generally to be found at about 30s. per square yard in Glasgow. As far as it may be of any use to us, I should be glad to know what is the relative proportion of cost of materials between Glasgow and London.

JOHN HONEYMAN, *Member of Council.*—My impression is that workmen's houses of the ordinary type in Glasgow may be erected for about 6d. per cubic foot, and it occurred to me from the remarks of Sir Sydney Waterlow that you were really a long way ahead of us in that respect—that is in the direction of making such houses pay—inasmuch as the buildings pay fully five per cent. while the land in some cases has cost £4 or £5 per yard, as against 30s. in Glasgow. It would therefore appear that we may learn some valuable lessons from you in this respect.

The PRESIDENT.—The question of building cost is one on which any information is interesting. Sir Sydney Waterlow was kind enough, some time ago, when I was taking up the subject of workmen's dwellings, to furnish me with the cost of all the sixteen blocks of buildings which, between the years 1865 and 1874, his company has erected. I will run down their prices per cubic foot. The cheapest rate at which they ever built was one block at 5d. per foot, but in that case a large amount of old materials and old bricks were utilised; and the most expensive cost them 8½d. per cubic foot. The prices on the various blocks built run as follow:—6¾d., 6½d., 6¼d., 6¼d., 6½d. 7¾d., 6½d., 7¾d., 8½d., 6¾d., 7d., 6d., 6½d., that exceptional one of 5d., 7¼d., and 7¾d. I think you will find the average of that is 7d., and that is over the years extending from 1865 to 1874, during which time, and since, the cost of labour has been rising. I have had some experience during the last four years in trying to solve this problem. As architect of the Victoria Dwellings Association I took pains to introduce all that could be usefully introduced to make them substantial; because the worst economy in erecting buildings like these, which are to be roughly used by the tenants, is to build them otherwise than strongly. But using every kind of economy we could not build, and do not build, under 7½d. per foot. Those buildings are, however, widely different from the simple lodging-houses, with sleeping cells and a public room, to which Sir James Watson referred, inasmuch as they are self-contained tenements. If the apartment consists of only one room it is fitted with cooking range, sink, &c., whilst tenements of three or four rooms have one room of the set fitted with those requisites. There is a separate water supply to each tenement, whether of two or three rooms, and a water-closet appropriated among about four tenements. I think providing a separate water-closet for each tenement does mischief instead of good, as you run greater risk of damage; space is taken up, and a separate closet is not, I think, a matter of such great importance as is sometimes alleged. It seems to me that, for the lowest classes, these extreme ideas of refinement may be carried too far.

P. GORDON SMITH, *Fellow.*—My experience has been rather in the direction of separate houses in the provinces where land is not anything like so dear as the land which has been chiefly referred to by previous speakers. During the last year I have visited a good many towns in the north of England to see the houses occupied by the working classes, and in all cases I found they were of a class rather above that to which reference has been made, the tenants being able to pay from 2s. 6d. to 5s. 6d. per week rent—each tenement being a house complete in itself, usually comprising two storeys above ground with an attic in the roof and a cellar in the basement. In reference to the arrangement of water-closets it is customary to provide them entirely out of doors, in clusters of six or eight, between or behind the blocks of cottages; and when properly managed I believe there can be nothing better. In some cases the closets are on the dry system, the local authorities undertaking the removal of the soil at frequent intervals, and no nuisance arises from them. In the case of small tenements in large blocks of dwellings, I believe that one closet to every two or three tenements would be quite sufficient. With reference to some of the sites which have been alluded to in the metropolis, I am under the impression that there is some more recent statute or perhaps a local Act under which, if the land required under the Artisans Dwellings Act be not appropriated to the purpose for which it is obtained within a period of three years after it has been cleared, power is given to the Metropolitan Board to sell it for other purposes. It seems strange that land should be allowed to remain idle so long as has been stated, and therefore it may be useful to know whether any legal power exists of disposing of it for other purposes than those for which it was originally intended.

The PRESIDENT.—On the subject just spoken of I have received a letter from Mr. Wyatt Papworth which is *à propos* to it. He writes :—

> "I have been assured that there is an Act, or a clause in an Act, by which if the vacant land is not let within three years for the purposes of artisans' dwellings it can be let for other purposes."

That was one of the questions I had intended to put to Mr. Vulliamy, because it is due to the Metropolitan Board that the question should be fully understood; I very much regret the absence of Mr. Vulliamy to-night because he might have been able to remove any undesirable impressions that may have been entertained on this subject.

W. WOODWARD, *Associate.*—I understood Mr. Vulliamy to say that it was not the object of the Metropolitan Board to make a profit by the sale of the land cleared for building sites. Now it was publicly stated, just after the formation of Northumberland Avenue, and I think in the *Building News*, that if the Metropolitan Board obtained a ground rent at the average rate of 3s. per foot super. it would recoup itself for the whole of the outlay, including the half million which was paid to the Duke of Northumberland. It has been since stated that the Board has refused offers of 5s. and 6s. per foot, and I should therefore be glad to be informed why, if a ground rent of 3s. per foot would recoup the outlay, the Board should refuse 6s.

The PRESIDENT.—I think that what Mr. Vulliamy said was not quite as the last speaker understood him. The question was whether the prices at which those areas, cleared under the Artisans Dwellings Act, were offered were remunerative, taken over the whole area cleared, and the answer was—no. That is true, but the Artisans Dwellings Act provides that a certain definite amount of the areas cleared shall be reserved and offered for building these dwellings. It may be said that the Metropolitan Board, as the representatives of the ratepayers, are bound to get the best

price they can for the ground; but that is not so, since the Act imposes the obligation on the Board to reserve certain parts of the cleared sites on which artisans' dwellings can properly be built.

Mr. MARK H. JUDGE.—I would beg to call attention to one point in connection with this subject. We must, I think, all feel that the great failure which has occurred in London with regard to this matter is largely owing to the want of a good system of government of the metropolis. In Glasgow a corporation exists, and no doubt all the excellent work which Sir James Watson has told us of has been simply the result of a good system of government. In London we have no system of government at all worthy the name. We were told last night that in the City there are waste lands which have been standing in their present condition for forty years, and Sir Sydney Waterlow pointed out the difficulties with which his company and others had had to contend in connection with the Metropolitan Board of Works. I think this state of things would not exist if we had a better local government in London, and until some proper and efficient system is inaugurated we shall not be able to carry out great improvements in the direction contemplated by Mr. Torrens in the measure he has introduced. Sir Sydney Waterlow said that one great defect of the parochial system is—what is very obvious—that, as certain localities benefited by improvements which were paid for by the ratepayers of the metropolis at large, the interest of each vestry is in opposition to any improvement being made beyond the area it represents, and this shows that what is wanted in London is some kind of central government. With regard to the model lodging-houses, of which we have seen plans, it seems to me we ought only to look upon them as stop-gaps. We want *dwellings* for the people, and not to have a large population changing their abode night by night, and having no settled home. Where need exists for a large number of model lodging-houses on the plan adopted in Glasgow, it means that there is a considerable population, more or less without homes, or in other words vagrant, and certainly this is not a desirable state of things to perpetuate.

CHARLES FOWLER, *Fellow*.—The last speaker referred to a question on which I should like to say a few words: namely, as to the authority for carrying out these works. It is remarkable that the hon. member for Finsbury, speaking here last evening, did not see the course he proposed was precisely the opposite to that which had been so successful in Glasgow, where there is a central authority. Mr. Torrens's proposal was that every vestry or local board should be invested with the powers necessary to carry out this work. Now, I would venture to suggest that a local body would be the last that would be likely to carry this out, for the reason that it must be done partly at the expense of the ratepayers, as this debate has shown. The people upon whom devolves the levying of rates upon themselves, are not likely to increase those rates more than they are obliged, by undertaking this work of providing dwellings for the extreme poor. As to the cost of construction, I will mention some facts that have come under my own knowledge. In one case a speculating builder of not large capital has erected some buildings for the accommodation of the artisan class in a central situation,—buildings of a good kind; not perhaps equal to those erected by some of the societies who have not merely profit in view—but good buildings. The staircases and corridors are fire-proof, and the rooms of fair height. The ground in question is let for what people like to put upon it, and at a rate which is considered high; it is chiefly used for warehouses and manufacturing premises. In this case the builder has erected three large blocks; there are streets on three sides, and therefore no internal areas were required. The houses are five storeys above the street, without basements. I have no doubt he would not build for less than 7 or 8 per cent. profit. The great difficulty is the cost of the ground more than that of the buildings. In the suburbs, within moderate distance, you can get land at very much lower rates.

Sir James mentioned that 1½d. per foot super. per annum was a moderate rate for the ground dealt with in Glasgow; but that is more than double the rate at which good building ground can be obtained in the suburbs, which gives a large amount of open space, as well as the ground occupied by the buildings. Speculative builders take ground at that rate and put up nice houses, moderately comfortable and attractive. Some that are being erected on ground belonging to a client of mine are rather better than usual, and let readily for about £28 a year. The houses, though intended for one family, are capable of accommodating two; and to a certain extent are fitted up with that view. They consist of six rooms, divided into two tenements of three rooms each; the cost being, therefore, less than 5s. 6d. per week for each family. The rent of Sir James Watson's lodging-houses is 1s. 9d. per week per person; and if you take an average of four persons, that would be 7s. per week. For three persons it would be about the same, but they have the comforts of a family dwelling instead of a little box. The result is, that persons of the artisan class prefer to go a little way out to get these moderately rented and fairly comfortable houses with a little garden or space at the back, instead of going into places where there is not that comfort and individuality which there is in self-contained houses.

The PRESIDENT.—I am rather unable to agree with my friend, Mr. Fowler, in thinking the working population are so ready to go to a distance from their work for the sake of the pretty little house and garden he speaks of. From my own experience it is a matter of importance that workmen should be domiciled as near as possible to their daily work, and it is a piece of irony to say they may take railway journeys to and from their dwellings. I think the problem we have to solve is, how we can put good homes in crowded localities in the midst of manufacturing centres, and the agency by which that is to be done. It has been suggested that in Glasgow, and in the places Mr. Fowler refers to, builders do undertake it, and find a profit. Builders in Glasgow appear to be content with 6 or 7 per cent.; in London they are not content with that. Whereas Associations which do not profess any extreme philanthropy, but look for some commercial return to justify the outlay of their money, are quite content to receive 5 per cent. It is clear that Associations of that class are more anxious to bring about useful results than to obtain a large percentage upon their investment of capital. But I asked Sir James Watson whether, in the Association over which he presided many years ago, those buildings paid at the outset, and he was obliged to say they did not pay for several years. They met with difficulties, and had to learn their lesson. Though at the outset they did not pay, in the end they did so. I think those who undertake this work should not therefore be discouraged if they do not see an immediate return for their money; and by a moderate amount of perseverance I have no doubt the results which have been proved in Glasgow may be achieved elsewhere. That that can be done better by Associations which are content with 5 per cent. than by individuals who require a higher return is quite obvious. We must bear in mind the gigantic dimensions of the problem we are called upon to solve in London. No amount of private means could suffice to meet the want now existing, still less the growing wants of a growing population. Therefore it becomes of the most entire necessity to set about the solution of this problem apart from any philanthropic feelings. An indispensable element in the matter is a fair percentage—not usurious—upon the capital invested. With a certain return of 5 per cent. there would, I believe, be an unlimited supply of money for these purposes; and if Associations can manage to show a clear, honest dividend of 5 per cent., it will go a great way in solving the problem. But how is that return to be secured? In the operations of building associations of this character there are some unalterable items of cost, and some alterable. The unalterable item is the market value of materials and the current labour price of the day. We know the cost of a building now compared with fifteen or twenty years ago, and that it is in proportion

to the wages paid then and now; that is the unalterable part of the problem. But there are many other items of outlay which the public authorities may, if they will, in various shapes, make alterable. The Metropolitan Board of Works, and other bodies like them, have absolute control, under the Artisans Dwellings Act, in fixing the price of the land applicable to these purposes. There are many sites existing at the present time for which they get no offer, and they never will at the prices which have been fixed. Their object should be, not alone the interest of the ratepayers whom they represent (though that is best consulted by the early utilisation of waste lands), but how to aid in carrying out an Act which is understood to be of general utility, and find out at what rate of rent or purchase per foot super. for ground it will pay Associations to build upon it. That should settle the ground rent at a moderate figure, and having so settled it they would have acquired justification to have a strong voice in the character of the building to be put on their ground; but if they try to get the greatest amount out of the land, they lose the control they ought to have over the building. Another alterable factor is the water supply. I can speak with some personal experience of the unnecessarily arbitrary way in which water companies deal with buildings of this sort. One case was that spoken of by Mr. Jennings, when he referred to the buildings at Battersea with which I was connected. The Vauxhall and Lambeth Water Companies were at first indisposed to supply water by meter, but they did so at last. In the case, however, of our buildings at Islington, we are dependent on the tender mercies of the New River Company—the most despotic of all the London Water Companies. Nothing would induce them to supply water by meter, and they would not listen to anything against the annoyance and cost of having so-called water waste preventors in separate cisterns in every water-closet; and I fear we shall have to submit until some greater authority steps in—thus leading the Victoria Dwellings Association to needless expense and curtailing the ample supply of water they would desire to furnish for their tenants. With respect to water companies, I would urge on the Legislature to remember that a particular class of buildings—these dwellings for the labouring classes—has arisen, which was not contemplated when these powers were given to the water companies, and that either by amendment of the existing Acts, or the passing of a new Act, the companies should be compelled to furnish water to this class of buildings at rates different from ordinary household rates and by meter. I now come to the question of assessment. There again the assessors of the vestry rates have for the first time to deal with a character of property to which the old system of assessment is wholly inapplicable, and that system is applied so oppressively that it becomes so serious an item in the annual outgoings from buildings of this kind, that to a great extent it diminishes the chance of their success in earning even a moderate dividend. In these three items I think the Legislature might fairly step in to aid those who undertake to erect artisans' dwellings: namely, as regards the price of the land, the operations and charges for the ample supply of water, and as to the mode of valuation for the purposes of parochial assessment of these buildings, differing as they do in many respects from all others. If this Discussion here is likely to produce any good effect, I hope it may be in some or all of these directions. Mr. Torrens gave a sort of vague invitation to this Institute to use its influence in the matter. Had he been present to-night, I would have asked him in what shape he thinks we could best exert any influence; and if those who have charge with him of his Bill of this Session, together with those ministers whom Mr. Torrens says always agree with him as to the object he has in view, should think fit to ask the Institute, by a committee of their body, to consider the question and give their advice, then I can see how we might aid in this good work. Short of that we cannot do more than place on record our opinions. In conclusion I will answer one speaker who alluded to the lodging-house system, as a make-shift, and as not meeting the desire for dwellings for the working classes, but I think, in the variable districts of London, there is room for

both sorts, and need for both. In some districts of London, lodging-houses like these are indispensable; in other parts, they would not be so useful, and dwellings such as have been already undertaken would be more desirable. Objection may be taken to the principle that commercial undertakings should receive the exceptional assistance which I have indicated. To that I would reply, that the same power which gave the facilities might say that a higher dividend than 5 per cent. should not be paid upon these undertakings. If a larger amount than that was earned it might go either towards building in districts not provided, or in reduction of rent over the whole area of which the area built on was part; and while no claim can properly be made upon the public to help the profits of individuals, there is every claim on the public authorities to promote that which is for the moral and sanitary benefit of the community, and that is after all the soundest and best economy of public money. We are therefore, I consider, justified in taking every step in our power to give good dwellings to our working men and the very poor, and when that is done we are justified in looking for the fruits that may be anticipated from the better health and better lives of a decently-housed community.

Sir James Watson, *Hon. Associate.*—I have to thank you, Sir, and the rest of my audience for the kind way in which you have received my Paper. I can only say if I have given any hints towards improving the sanitary condition of this or any other city, or which may lead to better dwellings for the industrial classes, I shall be amply rewarded. In looking at the whole matter I see it is surrounded by difficulties. There are two classes of property involved in this question—one the model lodging-houses, and the other the dwellings for the working classes. With regard to the model lodging-houses I feel with the gentleman behind me they are not sufficient to meet the wants of the community. He calls them stop-gaps. I would not go so far as that, but I look upon them as a means of providing for the wants of one class of the community. There is in all large cities a considerable amount of floating population—people seeking employment, who, having no friends, are obliged to resort to the lowest lodging-houses; and however pure they may be when they come from the country they become sadly deteriorated when they get into those lodging-houses. Therefore I think the model lodging-houses are valuable for this class. Then there are single men and women engaged in work who can find a place in these model lodging-houses far more comfortable than in many of the common lodgings. I have known cases in which people have lived ten or fifteen years in these houses, and it has been the means of enabling them to save money to purchase furniture and move into a better dwelling. I have been shown several specimens of closets for these houses. A very simple arrangement has been adapted in the model lodging-houses in Glasgow; by a simple means of ventilation of the pipe by a jet of gas any nuisance from smells is entirely obviated. With regard to the dwellings for the working classes, I very much agree with Mr. Fowler as to the necessity for having something more done than merely placing the matter in the hands of the local authorities, and I think the Bill of Mr. Torrens is somewhat deficient in that respect. I admit we have an advantage in Scotland which you have not here, in having a representative municipal government able to take powers to act over the whole sphere of the town, in place of being divided into various local boards as you have in London. Looking to the fact that it involves the taxation by vestries of themselves individually, I think there are great difficulties in the way of getting those gentlemen to act in the matter of purchasing ground and selecting sites to the extent which would be required. One great point I think would be the establishment of a competent body of Improvement Commissioners representing these various Boards, with powers to take the whole matter into consideration and to do what has been done in Glasgow: namely, to schedule property, sell houses, and either sell or rebuild. I cannot help thinking the results we wish to arrive at would be more likely to be attained in that way than by leaving it in the hands of the local boards. The next point is (setting partly

aside philanthropic considerations) to induce people to join in the building of these houses and be content with a return of 5 per cent. upon their money. I cannot conceive why, at the present price of land in London, it is not possible to build upon more economical terms than those which have been mentioned to-night. Builders must be content with a little less profit; and if there is a demand for workmen's houses, good houses will bring fair rents. Your rents are higher than those in Glasgow. It is a point worthy of investigation to know at what rate you can purchase ground and erect dwelling-houses of this description so as to give a fair percentage. I am not of the same opinion as the President with regard to the necessity of confining building operations of this kind to the immediate centre of the town. The ground in London is too valuable I fear for this. I do not think there is any great hardship for a tradesman to go a mile and a half or two miles to his work in order to secure a good house, with the existing facilities for travelling in London. In Glasgow great numbers of the population have removed from half to three-quarters of a mile from the radius of the town, and they have made no objection to it. We have tramways by which people can travel at the rate of a penny per mile. To go to another point: namely, building houses for those who are not able to pay an adequate rent. You cannot build houses for charity, and if people cannot pay a proper rent for houses they must go to the model houses; to expect to get building societies to let at half the rents other people are paying seems to me quite absurd. A great deal has been said about pulling down without rebuilding. I have been told that the Midland Railway Directors have cleared about eleven acres of ground and not a single house has been put up. We have a regulation in Scotland that you cannot eject 500 people without providing accommodation for them elsewhere. I should like to know whether a similar regulation exists in England. Such a provision if enforced would prove a salutary check in such a case as that to which I have alluded and against what has been stated: namely, that land has been lying unoccupied for forty years. I hope this discussion, which to me has been very interesting, will be the means of awakening public interest and of doing practical good.

X.—BILLS OF QUANTITIES: THEIR PROPER RELATION TO CONTRACTS. By John Honeyman, *Member of Council.*

Mr. President and Gentlemen,—As you are aware, the modes of measuring artificers' work vary considerably in different parts of the country; and still more markedly in other matters connected with contracting, the practice is diversified. In some localities the Quantities are taken out by a special class of men variously styled quantity-surveyors or measurers, in others by architects; in some they are taken out with the greatest minuteness and with elaboration of detail, while in others the descriptions are general and comprehensive, and the contractor is obliged to interprete the details for himself. In some it is customary to base the contract upon the plans and specifications alone, while in others the practice so greatly differs that the contract is based upon the bill of Quantities alone, and there is no such thing as a specification referred to at all. In these circumstances it is extremely probable that defects exist in many, if not in all, the methods of contracting for buildings now generally in use, and it is perhaps equally probable that each of the various methods possesses certain merits peculiar to itself, or more or less common to the others. An earnest and unprejudiced investigation into these peculiarities, then, cannot fail to be interesting and profitable; and I am sanguine enough to hope that it may lead to the conviction that the construction of a system superior to any of those now in use is not only desirable, but practicable. It is with the desire that I may be able to assist, however feebly, towards the realisation of such a consummation that I now address you.

Before proceeding to consider the various modifications which have been made, or which ought to be made, in the relative positions of building owners,—or proprietors, as I shall call them—architects, surveyors and contractors, I wish to direct your attention very specially to the elementary truth, which we must never lose sight of, that, in contracting, the normal state of matters is this: the architect having completed his plans and specifications occupies in relation to the contractor exactly the same position as his client the proprietor, who might in point of fact get in tenders himself without the further intervention of the architect. It is generally convenient for the proprietor that the architect should get in the tenders for him, but in doing so the latter, if he has followed his employer's instructions and represented what is wanted by sufficiently explicit plans and specifications, incurs no other responsibility. He has nothing to do with the means which the builder may employ to ascertain the value of the work. One builder may measure the work himself, another may get some one to measure it for him; one may have it minutely measured, another may do it roughly, or even guess what the value should be. All the proprietor, or his agent the architect, wishes, is an offer *bonâ fide* for the execution of the works he has illustrated and described. That, I say, is the normal relation of the parties in estimating. In these circumstances it is a matter of indifference to a proprietor or his architect what quantities of materials a contractor uses, so long as he executes his work satisfactorily in accordance with the plans and specification; the onus of ascertaining how to do this at the smallest cost rests upon him, and competition with others effectually keeps him from careless or wilful exaggeration. This responsibility was in former days fully accepted by contractors, and men who understood their business thoroughly had no difficulty in tendering without the intervention of a third party; moreover, they enjoyed a distinct and legitimate advantage over others who were less competent or experienced, the tendency of which was beneficial in many ways. Now,

however, so great a change has occurred in this respect that it would be extremely difficult to find in any locality contractors able or willing to tender for a work of any importance without bills of Quantities. The present generation of builders has become accustomed to them, and it may be safely said that many could not give an intelligent offer without them. The normal arrangement, as I have called it, is henceforth inapplicable, and it is generally admitted that it is impossible now, even if it were thought desirable, to return to it. But, and this I wish particularly to emphasise, it by no means necessarily follows that the change in the practice of contractors should affect in the slightest degree their proper relation to proprietors. The change has been introduced primarily to facilitate the work of the contractor, but the proprietor may and ought to share in its advantages. There is evidently something radically wrong if its effect is to load the proprietor with expense and responsibility for which he has no equivalent; and it is the duty of the proprietor's architect—or, speaking for proprietors generally, I may say it is the duty of this Institute, to see that we do not drift into the use of a system which must produce such results. This duty is, I think, brought home to us forcibly by this reason among other considerations:—that it is the proprietor who has to pay for the surveyor's work. In some cases this payment is made wholly or in part through the contractor; but in every case it comes out of the proprietor's pocket either directly or indirectly, whether he realises the fact or not. In one shape or another it is a charge which the proprietor must bear, and it is therefore clearly the duty of the architect in the interest of his client to see that the money is judiciously expended and that a fair equivalent is obtained. A second reason why architects should now devote special attention to this subject arises out of the circumstance that in times past they have too much neglected it. They have failed to control the development of the system which as it exists is eminently unsatisfactory—especially for proprietors—although regarded by our profession with a complacency or indifference which seems to me, I confess, astonishing. A third reason for their more active interference is that they may control the further development of the system, and by their united action counteract tendencies which are mischievous; confine the measurer to his legitimate province, and fully utilise his work for the benefit of the proprietor, who pays for his services. Of course, as we shall afterwards see, such a course is not incompatible with due consideration for the interests of the contractor. He is, and the quantity-surveyor ought to be, directly under the control of the architect, who is no more likely to act unjustly to the one than to the other.

Before suggesting some changes which I think would be advantageous, it will be necessary to refer at some length to the existing systems in different parts of the country, and to examine critically the special features of each which bear upon the subject. I have therefore arranged my remarks under the three following heads: Firstly, the actual state of matters; secondly, a critical examination of the prevailing systems; thirdly, proposed changes.

I. *Actual state.*—The first of these need not detain us long, because the Members of the Institute already know a great deal about it. You are all familiar with the modes of measuring and contracting in some localities, and many of you have had experience in all parts of the country from Land's End to John O'Groats. I must however for future reference state succinctly the distinctive characteristics of the systems now generally recognised. First, and by far the most extensively practised, is that to which you are accustomed here in London. In your practice the bills of Quantities, or the "Schedules"—as we call them in the North, and I think the term is more convenient—after they have been issued are practically ignored by the architect. They are, whether prepared at the instance of the contractor or under the direction of the architect, regarded simply as aids to the contractor in arriving at an intelligent idea of the cost of the works, and it is the exception when they are still further utilised as

guides in fixing the cost of additions and deductions. Formerly, and not many years ago, it was usual for the contractors to choose the surveyor, and in works of considerable magnitude a second surveyor was employed by the proprietor as a check upon the other. This cumbrous system is still largely adhered to, but it is rapidly losing favour* and the employment of a single surveyor is becoming more usual. Moreover many architects, acting as the proprietors' agents, themselves select surveyors in whom they have confidence, whose bills of Quantities are generally accepted by contractors as a safe guide. But, strange to say, the architects have failed to recognize the fact that this interference on their part *necessarily* alters the relation of the schedule to the contract, and they still assert that it has no relation. It is therefore ignored; the proprietor is supposed to have nothing to do with it, and an attempt is made to free him from responsibility by a legal figment—the arbitrary transference of the surveyor's services to the contractor at a certain point.

With slight modifications which for our present purpose it is immaterial to mention, the London system is followed throughout England and Ireland. But generally the interference of the architect is carried a step further in the Provinces: he does not select a surveyor to take out the Quantities, he takes them out himself, thereby incurring serious responsibilities over and above those which his position as an architect necessarily entails; in fact, he becomes responsible both to the proprietor and the contractor, an anomalous and a dangerous position. Both in the London and the English provincial practice the surveyor is paid by the contractor, unless there is an express agreement to the contrary.

The Edinburgh system resembles that of England in many respects, the principal differences being these:—contractors never have anything to do with the selection of the surveyor or measurer, as he is called, who is always employed by the architect; the measurer is paid by the proprietor, and the schedule is referred to in the contract. It is lodged with the architect with the various items cashed and summed up, and the rates contained in it regulate the cost of additions or omissions which may be ordered in the course of the work. It is also a useful guide to the architect in certifying for instalments. A somewhat similar arrangement is sometimes made in England and Ireland, but in these cases the priced schedule is generally lodged under seal, and even with this modification the practice is by no means common. There are some other shades of difference in provincial practice, but no other system is sufficiently distinctive to merit notice except that which prevails in Glasgow and the West of Scotland. In Glasgow the schedules have superseded the specification altogether, and it may almost be said that a specification is never referred to in the contract at all. The architect selects the measurer, who, with the aid of the drawings and specification, or such substitute for that as he may get, prepares a detailed schedule of Quantities. Copies of this are issued by the architect to selected tradesmen, who are invited to tender by a certain day. These schedules are returned to the architect with rates filled in at each quantity, the amount extended, and the total summed up at the end. A letter accompanies, or more generally is attached to, the schedule, in which the builder offers to execute the work in accordance with the drawings, and "to the extent of the schedule" for the sum brought out by the addition of the extended prices, it being further provided that the whole of the work shall be measured after it is finished, and whether it turns out to be more or less than estimated the cost shall be determined by the rates contained in the schedule; or, where these do not exactly apply, by others strictly in proportion to them. Having considered the various offers, the architect writes on behalf of the proprietor accepting the one which is preferred, and that completes the transaction; in nine cases out of ten there is no more formal contract. When the work is in progress, and when it is finished, the measurer measures it, and prepares a final

* It will be seen that the author, in his reply (on page 199), alluded to his misapprehension of the details of the London practice.

measurement applying the schedule rates to the various items, and so bringing out the total sum to which the contractor is entitled. This document is examined by the architect, and if he is satisfied that it is compiled in accordance with the estimate he signs it as a final certificate. Half of the cost of the original schedule and subsequent measurement is deducted from the contractor's accounts, and the proprietor pays the full amount—that is ostensibly the half, but in reality the whole. In the East and North of Scotland the Edinburgh system is more or less closely followed, while in the West the Glasgow system prevails; the principal difference in the smaller towns being that in most cases the architects prepare the schedules themselves instead of employing measurers.

From the foregoing brief account of the existing state of matters, it will be observed that, leaving out of account the now comparatively rare cases in which no Quantities are supplied, there are three distinct modes of estimating in common use, in each of which the schedule or bill of Quantities occupies a different relation to the contract. In the first the actual contract is independent of it, and its only use is to enable men to form a correct estimate of the sum for which they may prudently contract. In the second the schedule is supplementary to the contract; it is a sort of appendix regulating the modification of the contract in certain contingencies, and also supplying the architect with information which is very useful to him during the progress of the work. In the third the schedule is the contract to all intents and purposes. Now as these three modes of estimating have been in use for many years in the largest centres of population, we may reasonably expect by careful consideration of their working to obtain some useful lessons, and this none the less although we may be compelled to regard the existing state of matters as upon the whole unsatisfactory—the existing diversity itself indeed, being unsatisfactory.

II. *Examination of prevailing systems.*—I shall now examine the distinctive characteristics of the three modes of estimating just described. First, then, let me criticise the London system with its modifications as practised generally throughout England and Ireland. Not many years ago, before it was customary to supply Quantities, the London mode of procedure was theoretically right, though somewhat inconvenient for contractors—the architect showed and described exactly what was wanted and left the contractor to find out by any means he thought proper what the work would cost. The issuing of the Quantities by the proprietor or his agents, however, makes a fundamental difference. One good feature remains, namely this, that if no changes are made after the contract is entered into the proprietor knows exactly, before the work is commenced, what he will have to pay for it. This feature, however, is not peculiar to the system. Before it became customary to supply Quantities contracts were equally definite, and it would be rash to conclude that they were less favourable for the proprietor; on the contrary, the customary allowance for contingencies has now probably been increased, and in most cases the definiteness is only obtained at an extravagant cost; and I by no means regard definiteness as a thing of little consequence. Now I fear you will consider me to be extravagant when I declare—as I am constrained to do—that I have failed to discover anything else about the London system and peculiar to it which merits commendation. Nor is this unsatisfactory state of matters to be wondered at, because you have made the radical mistake of adhering nominally to a principle which practically you ignore, while you have gradually introduced a practice which, if followed to its legitimate issues, is antagonistic to it; and you have thus insensibly drifted into a false position. Hence naturally the confusion as to the relative responsibilities of parties and the inconsistencies and contradictions of legal opinion on the subject. The root of the evil—and it has many branches—seems to be the illogical and, I think, illegal epudiati on of the responsibilities necessarily associated with the act of supplying Quantities. It is

clear that logically and in equity the party estimating, not having any voice in the selection of a surveyor, and having no means of testing the accuracy of the documents given to him for his guidance by the proprietor through his agent the architect, ought to have recourse against the proprietor if he can prove that he has been either unintentionally or deliberately misled. This you deny, and this denial leads to many objectionable consequences. Traditional usages and prejudices bind you to the old theory that it is the contractor's look-out to see that the Quantities are accurate. Although you know perfectly well that in ordinary circumstances it would be absurd to expect him to do anything of the kind, and that in point of fact he takes the accuracy of the Quantities for granted either because he has faith in you, or faith in the surveyor, or perhaps because he has faith in the chapter of accidents and cannot have a chance of contracting unless he accepts what you give him for his guidance. As a last resort, you take refuge in this expedient: you declare that you are not, or that you are not to be held to be, responsible; you roll the responsibility over upon the surveyor (whether appointed with or without the concurrence of the contractor), and tell the contractor to pursue him if he has any cause. Now it is quite right that the surveyor should be responsible for the accuracy of his work, *but not to the contractor;* for observe, the necessary result of such an arrangement is that the preparation of the bills of Quantities and all responsibility connected therewith are virtually handed over absolutely to men whose interests are, if not antagonistic to, at least entirely different from, those of your client. The contractor has a twofold interest: to please you, so as to retain your good-will; and to make a profit. The surveyor, if you make him entirely the servant of the contractor, has also a twofold interest: to please the contractor, which he can best accomplish by assisting him to make a profit; and to take care that he himself incurs no risk from the responsibility which you throw upon him. The interests of the proprietor are obviously a matter of indifference to both. As a matter of fact, both contractors and surveyors of the better class do respect the interests of the proprietor, but having regard merely to the actual relation of parties, there is no reason whatever why they should; and, it is needless to say that contractors and surveyors are *not* all of one class. Now, gentlemen, I cannot understand how you reconcile such an arrangement with a due regard for the interests of your clients. It appears to me that your interference with the contractor has either gone too far or not far enough. In the old-fashioned system of estimating, the experience of offerers came into play as a safeguard against excessive cost, but having departed from this, having abolished competition as a check on the accuracy of Quantities and made the amount of the offers to turn on the mere variety of rates, you take totally different ground and ought to be prepared for a change of aspect. In the altered circumstances one or other of two things seems to be indispensable; either the absolute accuracy of the bills of Quantities must be guaranteed, or some new arrangement must be adopted by which the interests of the proprietor, as well as of the contractor, shall be secured in spite of inaccuracy in the bills of Quantities. Now, the first of these alternatives is hardly practicable, and, as far as I am aware, you have made no attempt to face the second.

It is probable, indeed natural, that the London system, and the Edinburgh system, which is not essentially different, should upon the whole work smoothly and satisfactorily. It throws no undue burden upon the architect; the contractor and surveyor have, as I have just shown, good reason to be satisfied with it, while the proprietor, however adversely affected, knows nothing whatever about it, and is content to pay what his architect certifies to be justly due. The absence of friction in the working of such a system is obviously no indication of its harmonious adjustment; and the helplessness of proprietors and their complete dependence upon us for protection ought to appeal very strongly to our sense of duty and encourage us to grapple with the difficulties of the situation.

I must not pursue the subject further under this head, but this is of the less consequence, as I

shall have occasion to refer to some other defects and anomalies when treating of the Edinburgh system which is affected by the same vicious principle of undefined or empirical responsibility.

The Edinburgh system, in so far as it provides for the modification of the contract in accordance with the rates in the schedule, differs from the English system as generally practised, but it affords little (if any) further protection to the proprietor. The question of responsibility is more boldly dealt with, but not more successfully. The measurer expressly states in the schedule that its accuracy is not guaranteed—that is, of course, either by the measurer or the proprietor—and contractors are therefore requested to satisfy themselves on that point, which is simply absurd. Practically the measurers take care to measure the work fully, and the contractor adds a percentage for contingencies and takes his chance of being rightly guided to the cost. Now you will observe that to the extent of this fulness and this contingency percentage, the proprietor is a loser: he gets no value for either. There is no effective check on the omission of portions of work which, although embraced in the schedule, may have been inadvertently left out of the specification, or of works put into the schedule by mistake. Suppose, for example, the measurer inadvertently doubles the number of cubic feet in the stone foundations, the contractor—executing the work to the full intent and meaning of the drawings—would pocket the value of the double quantity of foundations without anybody but himself being a bit the wiser. Here, again, the unfortunate proprietor alone would be the loser, and his case is indeed a hard one; first he pays the measurer, then he pays for everything that is done, and he also pays for everything mentioned in the schedule, even if it has not been done—that is of course assuming that no alteration has been made on the plans and specifications by order of the architect. It may be said, indeed, that there is every likelihood that errors to the prejudice of the proprietor may be balanced by others in his favour, but granting this—granting that the surveyor is as likely to make a mistake the one way as the other—observe where this doctrine of compensatory errors must lead you. There is a chance of errors being made which shall balance each other, but on the other hand there is hardly any chance that two such errors as I have noted (and it is not an imaginary illustration) shall be made in one bill of Quantities. It would say very little for the surveyor if they were. But even the assumption that they may does not relieve you from the difficulty, because while it is quite true that they may balance each other there is at least an equal chance that they are both in favour of the contractor or both in favour of the proprietor. If however you admit, as doubtless you will, that a surveyor only makes such serious mistakes as this occasionally, then it necessarily follows that while his first mistake seriously injures one contractor, his second may as materially benefit another, but the thought that this is likely to be the case can hardly be expected to afford either compensation or comfort to the man who has suffered. A different system is required to protect the contractor in the one case and the proprietor in the other from serious wrong; it is a most unscientific procedure to relegate such a function to *chance*.

Let me illustrate another set of difficulties, which the system cannot satisfactorily deal with, by an actual case. In a town, which I need not name, two Banking Companies resolved to erect new offices. They employed the same architect and the sites were contiguous, but in everything connected with the planning and contracting for the buildings they acted independently, so much so indeed that they employed different measurers. It was arranged that the wall separating the two offices should be a mutual or party-wall, but inasmuch as complete plans had to be made for each Bank, the party-wall of course had to be shown on each set and being so shown it was in due course measured by both measurers. Now it so happened that the same contractor got the contracts for both buildings, and it never seems to have occurred to anyone till the work was done, that by his contracts he had exactly twice as much for the party-wall as he ought to have had; he had erected both buildings

according to the plans and specifications, but he had erected only one party-wall and was entitled to payment for two. The contractor refused to submit to a reduction on the ground that he had offered to do the work for a lump sum. He also pleaded that for some other portions of the work the Quantities stated in the schedule were insufficient. Finally it was agreed that the whole work should be re-measured in accordance with the Glasgow system under which no such difficulty could have arisen. In this case it will be observed that the final arrangement was facilitated by the architect having in his hands the priced schedules according to the Edinburgh custom.

The remarks I have made on the English and Edinburgh systems evidently point to this conclusion, that both are generally advantageous to contractors at the expense of proprietors, and that this state of matters is tolerated simply because proprietors do not understand the subject, and architects, on whom they rely for protection, have not decided—many have not considered—what measures of reform are desirable, or practicable. Cases in which contractors are the victims do sometimes occur, but they are comparatively rare; as a rule, contractors look after their own interests in time, and it may be, as in the case of the Worcester Guildhall (to which I shall further refer), succeed in getting an arrangement made which relieves them but subverts the system. There is no hope for them except by such subversion. Where the systems under review are strictly enforced, most of us have known cases of extreme hardship—as they are called—but which would be more accurately described as cases of gross injustice, in which contractors have been refused payment for work which, to the certain knowledge of both the proprietor and architect, was not provided for in the estimate, and the value of which was deliberately withheld from the contractor on the plea that he was bound to do the work according to the plans and specifications, without reference to the Quantities. In such circumstances the case of the contractor is rendered still more hopeless and helpless if the architect is also the measurer and the sole arbitrator. Such a combination of functions is generally to be deprecated, but it is utterly unjustifiable when there is no re-measurement of the work, and its legality would seem as questionable as its expediency. It seems to me an extraordinary thing that any Court of Law should recognise or respect the pretensions of an individual who claims to be at once the accused and the judge, a party in the arbitration and the sole arbitrator. By a recent decision, however, in the case of Stevenson *versus* Watson, in the Court of Common Pleas, it appears to be ruled that an architect may so act; and that because he must exercise "judgment or opinion" in two of these capacities, he shall be utterly irresponsible for his conduct in the third. That at least is how I understand Lord Coleridge's judgment in this case. The Quantities taken out by the architect and the additions and omissions measured by him may be grossly inaccurate, but because he has to exercise "judgment or opinion" as judge and sole arbitrator in his own cause, the contractor must be debarred from challenging his accuracy, and must be left helplessly at his mercy. Of course in the case in point there may actually be no inaccuracy. I express no opinion on that subject, not having seen the arguments, though the above inference seems to be warranted by the judge's opinions. I am tempted here to refer to a remark which fell from Mr. Justice Denman. He said :—"Ordinary acquaintance with building contracts showed that an architect could not be regarded as a mere caster-up of figures, and ought not, therefore, to be held liable for negligence where a mistake in figures or measurements occurred." That is a strictly fair and accurate statement of an architect's position; it is not a strictly accurate statement of a measurer's position. The latter is clearly responsible for the accuracy of figures and measurements, and the architect-surveyor cannot escape from this responsibility by the mere assumption of the twofold duty without great injustice to contractors. In such a case as that of Stevenson *versus* Watson, it may for ever remain doubtful whether the contractor is justly treated

or not; but here again, as in my previous illustration, the re-measurement system would clear away all dubiety, and prevent all chance of complications and law suits, thus standing out in marked and favourable contrast with the prevailing systems in England and Edinburgh.

The grand obstacle to the satisfactory working of these systems as at present practised seems to be the impossibility of securing either an effective attachment of responsibility or the substantial results of its due recognition. While some legal authorities maintain that the measurer is responsible both to the proprietor and the contractor, others hold that he is responsible only to the proprietor, who is responsible to the contractor. This latter view seems most consistent with the well-known legal principle that one cannot at once "approbate and reprobate." If a proprietor issues a schedule of Quantities as a safe guide for a tradesman from whom he wishes a tender, it seems most consistent, both with sound law and sound common sense, that he should bear the consequences of inaccuracies which might prejudice such offerer; otherwise contractors might be systematically swindled with impunity. But at present special agreements, in violation both of common sense and law, come in to cause confusion and seeming contradiction in legal decisions. Such *ex parte* contentions however can hardly be justified, and at all events it will generally be found in practice that while proprietors are not likely to hear much about Quantities which err by excess they are sure to find the burden of responsibility for any serious deficiencies, by some means or other rolled over upon them. In this connection such a dispute as that which recently arose regarding the contract for the Worcester Guildhall is instructive. In this case, which was reported in the professional journals about six months ago, it is the contractor as usual who discovers that he is aggrieved. He demands a readjustment of the contract on the ground that the Quantities supplied to him for his guidance in making a tender were inaccurate, which he is prepared to prove. This seems a most reasonable demand, but he is met with the plea that the bills of Quantities were not referred to in the contract. This plea, however, was not maintained and ultimately a new arrangement was made with the contractor; the proprietors no doubt in this case recognised the manifest absurdity of expecting the tradesmen, before offering, to satisfy themselves as to the accuracy of the Quantities. It will always be extremely difficult for proprietors to get rid of the responsibility of their own act in issuing Quantities; it ought to be impossible for them to do so. Many cases such as the above prove that, in addition to other burdens which the present system lays upon them, they may at any time be called upon to submit to a "scientific rectification" of the contract at the instance of the contractor; and this notwithstanding that theoretically they are not responsible. As I have shown, the payment of the surveyor by—although it is really only *through*—the contractor, is held to make him the contractor's servant and so responsible to him. I have already shown how prejudicial this is to the proprietor's interest, but besides that, it is not a straightforward arrangement, and as we should expect misses its object. The truth is that the full acceptance of this responsibility by surveyors would in most cases be of not the slightest avail either to the proprietor or the contractor, because obviously a guarantee of accuracy is valueless unless the guarantor has adequate means to meet claims which those to whom he is responsible may legally prefer, or rather substantiate. Now I fear both proprietors and contractors would stand a very poor chance of getting two or three thousand pounds—or even two or three hundred pounds—from the average quantity-surveyor, however valid their claim; and if so it is clear that this attachment of responsibility is merely fictitious. Some have proposed that architects should be responsible, but under the present system with which we are at present dealing, architects are not involved unless they think proper to involve themselves by acting as surveyors—a practice which, under present circumstances, is probably as objectionable as if they also acted as masons or joiners.

Architects who act as their own surveyors necessarily put themselves into this equivocal position: they are liable at any time to be pursued by the contractor, who, theoretically, is their master; and surely a contractor can make an action-at-law a more powerful lever for moving the architect as he pleases than a direct bribe. On the other hand the architect-surveyor alone can discover and expose blunders of his own which prejudice the proprietor who is also his client, and if the exposure of such blunders would involve him in a loss of several hundred pounds I leave you to estimate the chances of such an exposure being made. The position of the architect as the impartial arbiter between the contractor and proprietor is one of sufficient difficulty and delicacy without the interference of such complicated responsibilities, the effects of which, on average human nature at least, must be vicious and demoralizing.

Upon the whole, I think it must be conceded that the English and Edinburgh systems are inconsistent with any intelligible theory of the proper relation of parties, and that the practical outcome of both is this: To the proprietor, unproductive expense, indefinite responsibility, liability for payment of work which he does not get, but which has been either inadvertently or purposely measured in excess of what the plans and specifications require; to the contractor, great facilities for estimating, for obtaining payment for everything which he does, and for obtaining payment for much that he leaves undone.

The remaining system to be considered, that practised in Glasgow, distributes its favours more equally. By it the proprietor is entirely relieved from responsibility connected with the Quantities; he is called upon to pay only for what he gets, and the contractor gets paid for what he does and nothing more—nothing being referred to in the final measurement except what has been actually done and measured.

This mode of contracting is by no means free from drawbacks, but it is the logical consequence of the interference of the proprietor or his architect with the preparation of the schedule of Quantities, and I can see no escape from it. It has many excellent points: it solves the difficult question of responsibility which we have just been considering, and supplies the only substitute for a guarantee of absolute accuracy which has been practically tested. The experience of many years has proved that this substitute is complete and satisfactory, or as nearly so as the circumstances permit. The arrangement is equitable, and it deals impartially with the two parties chiefly interested, which, as I have shown, the other systems do not. Even clerical errors are as likely to benefit the one as the other, and there is always the check of the second measurement *de novo*. The result is that all cause of quarrel and excuse for complaint is removed, actions connected with contracts are almost unknown, and the system altogether works satisfactorily on this solid and intelligible basis: the mutual convenience and interests of the parties. The defects of the system have recently been the subject of discussion before the Glasgow Architectural Society. They are almost entirely of a kind which would vanish before a little determination and co-operation on the part of architects and measurers; and I have no doubt that some improvements will very soon be introduced. Passing from this I must notice one objection which is often urged against the system: that it leaves a proprietor in uncertainty as to the cost of a building till it is finished and measured. But this is not so, unless the architect has neglected his duty in the preparation of proper plans and specifications. If an architect neglects his duty in this respect, the proprietor is not relieved from this uncertainty by any other system, as it is then impossible to foresee the probable extras. If it were otherwise the objection would be fatal to the Glasgow system; but if the experience of a hundred years proves that there is no likelihood of any discrepancy between the estimate and the measurement—that practically there is none, except where it can be clearly traced

to the carelessness of the architect or the measurer—then it will be seen that there is little weight in the objection. If the architect and measurer do their duty, there need be and there will be no difference between the measurement and the estimate; if they neglect their duty it is perfectly obvious that, in justice both to the proprietor and the contractor, there *ought* to be a difference, and the two offenders, or one of them, should at least suffer in professional reputation.

It can, I think, be proved that with equally explicit plans and specifications, there is less chance of the final account exceeding the tender under the system of re-measurement than under any other; and not only so, but (and this is an important set-off against some uncertainty) the work is done at lower rates than if it were not to be re-measured. It is only in localities such as Edinburgh and Glasgow, where contractors are accustomed to both systems, that a comparison in this particular is possible, and there it has been abundantly proved. I have been assured by contractors of high standing and long experience that they invariably charged from 10 to 15 per cent. more for work which was not to be re-measured, besides a considerable sum to cover contingencies. When the work is re-measured, not only does the proprietor pay only for what he gets, but he pays from 10 to 15 per cent. less for it; and this, you will admit, is a very substantial advantage. Another objection, which may be fairly urged against the Glasgow system, is that it has a tendency to encourage carelessness in the preparation of the documents necessary for obtaining an accurate estimate. Knowing that all will be made right at last, the architect is tempted to pass the plans on to the measurer in an incomplete state, and the measurer to assume Quantities which, in consequence of that incompleteness, cannot be exactly ascertained. The undue haste of the architect, it is true, is often the result of undue pressure from the proprietor, who does not realise how necessary ample time is for the preparation of complete working drawings. By resisting this urgency we may escape the danger on the one side, and by exercising proper authority over the measurer we may escape it on the other. Of defects of a more accidental character I shall mention only two. One is, that the facilities afforded by the system for obtaining estimates encourage young men to undertake work on their own account before they are properly qualified to do so. A man who could not write a specification himself gets an experienced measurer to prepare schedules for him, who thus gives him the benefit of the specifications of others. Another defect is the undue delay which usually occurs in settling accounts. This is caused chiefly by measurers neglecting old work for the sake of securing new; and to such an extent is this sometimes carried, that I have known premises entirely and satisfactorily finished and occupied for twelve or eighteen months before the tradesmen's balances could be ascertained. This, I need hardly say, leads to much inconvenience, and frequently to heavy and undeserved loss, both to contractors and architects. I endeavour to mitigate this abuse by employing several measurers, instead of confining myself to one or two, which would really be much more convenient and agreeable in many respects. But there is no reason why the evil should exist at all; and it might, with other abuses, be entirely swept away, if architects would co-operate and take a more complete control over all the operations of the measurer.

It may, perhaps, occur to some to suggest another objection to the system: namely, that it is impracticable—that it is, in short, impossible to re-measure a large building; but that objection is very easily disposed of. It is not only practicable, but it is constantly done, and buildings of every size and complexity of detail have been measured when finished in Glasgow and its neighbourhood during many generations; that question therefore need not be discussed.

III. *Proposed changes.*—What I have already advanced points to these conclusions: That the usual practice in contracting is radically defective, being based upon false principles, which are

inimical to the essential requirement of any tolerable system—namely, that it should insure justice to both parties to the contract; and that the practice of making the schedule the basis of the contract and re-measuring the work when finished is sound theoretically, and practically efficient. If this be so, it necessarily follows that it is the duty of our profession to make considerable changes in the direction of adopting the good features of the re-measurement system, eliminating the bad, and guarding against its accidental abuses. This involves an entire change in the relation of the bill of Quantities to the contract. In short, if we take any cognisance of the Quantities at all, we must, in justice to our clients, recognise them to be, along with and quite as much as the plans and specifications, the basis of the contract. I have not said that that course is preferable to our taking no cognizance of Quantities at all; but what I do insist upon is, that we must adopt either one alternative or the other—either to have *nothing* to do with the quantities, or to have *everything* to do with them; either to allow the quantity-surveyor to be entirely the servant of the contractor, or entirely the servant of the proprietor, and therefore our servant, directly under our guidance and control.

I have thought it advisable to occupy the time at my disposal to-night chiefly in exposing the errors of existing systems, feeling that it was impossible on this occasion both to treat that part of my subject with sufficient detail and also to explain various modifications of the re-measurement system which might be advantageously introduced. Besides, I am sensible that it is vain to talk of the details of reform if I fail to convince you that reform is needed. I cannot indeed believe that the members of the profession generally are content with matters as they stand. Recent discussions of kindred societies, recent articles and correspondence in professional journals, recent opinions of counsel and actions before our Courts of Law, all indicate at once the existence of wide-spread dissatisfaction and its justification. Indeed the time seems rapidly approaching, if it has not already arrived, when we shall be compelled to deal with the whole subject in a liberal and resolute spirit. Meantime, I shall only further trespass on your patience in the hope of extending the scope of the Discussion by re-making, in conclusion, one or two additional remarks on the measurement system, towards which I think we are gradually approaching. An ideal contract would secure for the contractor payment for everything he was required to do at certain pre-arranged definite rates, or, where these do not apply, at current rates; and, on the other hand, it would secure for the proprietor full and just value for every penny which he was required to pay. Now this ideal is very fairly realised if the work is carefully measured and priced to begin with, and again carefully measured and priced when finished. The whole thing is remarkably simple; there is no mystery or difficulty about it. All parties have good grounds for satisfaction with such an arrangement; and I may add that there is no difficulty in dealing with every variety of work in the same way. It may be interesting as indicating how successfully such a system disposes of all legal difficulties, and how well it works even with its present defects, if I mention, on taking a hurried retrospect of my own experience since I commenced business on my own account, that I have accepted upwards of 1100 tenders for the principal departments of work connected with buildings, besides innumerable offers for specialties; I have had to cancel contracts, to supersede bad contractors, to get rid of bankrupt contractors and arrange with their creditors without allowing the interests of my clients to suffer; to make deductions from contractors' claims; and, generally, to do all the varieties of disagreeable work usually devolving upon us in connection with such matters. But the lawyers have had nothing whatever to do with these 1100 contracts, and not one single action-at-law has emerged in connection with them. A system capable of producing such results would doubtless, if freed from its admitted defects, prove generally acceptable and highly beneficial. In this matter, however, we are helpless, unless we act in unison, and we naturally turn to such a body as this Institute for guidance.

It will be observed that the proposed changes which I recommend are: a radical change in the relation of the bills of Quantities to the contract, and subordinate changes which will then be expedient. I shall now only venture to mention one of these. Assuming that the system of re-measuring is generally adopted, it will be found that in some respects the interests of architects will be more directly affected than at present by the conduct of the measurers, and it has occurred to me that many of the minor defects which we find in the working of the system might be removed and the interests of the profession protected, if measurers were not allowed to practise—in other words, if they were not employed by architects — unless they held a certificate of competency from the Institute. This at first sight seems rather a startling proposal; but after a good deal of consideration I believe it to be practicable, and I am certain that, if carried out, it would be beneficial. I may not now expound the many reasons which support this belief, but I may remark generally that, if a change in the mode of estimating is introduced, such as I believe to be necessary to meet fairly the exigencies of the case, it is evident that it will rest entirely with the architects of the country to determine the exact position which the measurer shall hold, and the functions which he shall perform. In the altered circumstances, indeed, architects might with perfect propriety measure their own works, or even make measuring a branch of their business; although I may say that, personally, I regard such a course with strong repugnance. Now, in suggesting such a comprehensive stretch of the Institute's authority, it must not be supposed that I speak merely as a member of the Institute with an exaggerated idea of its cosmopolitan influence. I know very well how far short it comes of our ideal; but it is, nevertheless, all we have in the shape of a national professional association, and in such matters of general interest it is bound to assert itself, and to direct and govern the current of reform. Were I not a member, I would be equally solicitous that the Institute should take the matter in hand; and this feeling will, I am sure, be shared by members of the profession throughout the country. It is to be regretted that every one who is duly qualified is not a member. It is needless to point out how immensely such union would strengthen our position as a profession when we come to deal practically with measures such as these, directly affecting us all. I am confident, however, that in introducing changes in our mode of contracting, which may be generally acknowledged to be beneficial, the Institute might safely calculate upon the active and hearty co-operation of all members of the profession throughout the country. Even now the representative character of the Institute, and its value as the only organization which can efficiently deal with professional difficulties, is more generally recognised than it has ever been before; and I am sanguine enough to believe that that recognition is destined to be progressively more cordial, more universal and therefore more energetic.

DISCUSSION.

ARTHUR CATES, *Member of Council.*—The manner in which Mr. Honeyman has dealt with his subject—and we must all be obliged to him for having introduced it—is bold, I may even say too bold; it is original, I may even say strikingly original. Special importance will be attached both here and elsewhere to some of his opinions, which appear to me to have been founded on insufficient or inaccurate information—and these, if taken without the qualification he intends, and indeed adds, may have most serious results. Mr. Honeyman implies, though in different language, that all responsibility with respect to the Quantities is virtually handed over, by the London system, to men whose direct interest it is to victimise our clients to the greatest possible extent. He also says that when the responsibility of ascertaining quantities, on which to base estimates or tenders, is thrown upon builders directly—each one having to obtain the necessary information as best he can—that is done without cost to the proprietor; and in a sentence which follows he implies that the actual taking out of the Quantities gives rise to a considerable increase of cost to the proprietor or client. The statements are erroneous and evidently arise from a misapprehension of the actual facts. A contractor, when asked for an estimate, puts down the amount of cost that he has incurred in making it, in some form or other, and when half-a-dozen contractors are invited to tender, and half-a-dozen different tenders are sent in, each has had the expense of preparing it added or included. Evidently it is more convenient in such a case that one surveyor should act for the whole, supply each contractor with the Quantities, for thus one expense only is incurred, an infinity of labour saved, and great risks of inaccuracy—and especially of injustice to the proprietor—avoided. Some years ago, before the importance of Quantities was appreciated by architects and their clients—and they were often repudiated by both—it sometimes happened, when tenders were invited for say a public building in the provinces, that two, three, or sometimes four speculative surveyors would rush to the spot in keen rivalry. Each would act independently for one or more builders, squabble for access to the architect's drawings—each anxious that his employer should secure the work in order that payment to the surveyor might be secured. The estimates were made in the best way they could, and generally in anything but a satisfactory manner. The evils resulting from this mode of estimating were so great, and the advantages of what has come to be called the London system became so manifest when widely known, that its adoption is now almost universal—greatly to the advantage of all the parties concerned, and not less to the proprietor than to the contractor and to the architect. This London system has not, however, been accurately described by Mr. Honeyman. He says there is something radically wrong in the cost of Quantities, and that the employer gets no adequate equivalent for the expense incurred. But, in my opinion, the proprietor has, if the Quantities are properly prepared, a most complete and thorough equivalent. I venture to assert, if the Quantities are properly prepared, the proprietor has a full equivalent for the surveyor's commission and it is to his direct advantage that Quantities should be prepared. He has the equivalent of contractors being placed on a level with regard to Quantities, and thus being enabled to make the competition as regards price keener than it could otherwise be; he has the equivalent of a clear basis on which the contract is founded; he has the equivalent of accurate knowledge of the work which is comprised within the contract, and when the final settlement of the accounts is reached, they become of the highest importance. It is all very well for some architects to say that they repudiate Quantities and will not take them into

account. In some cases, even where architects fully appreciate the benefit to be derived from them, proprietors may resist Quantities being taken into account, but in the great majority of cases they are taken into account, and become of the highest importance in determining the liabilities between the contractor and the employer. There has been so much that is excellent in idea and suggestion in this thoughtful Paper, that I have been surprised to find the author has not appreciated these advantages; therefore it seems to me that Mr. Honeyman's information must have been of a nature different from the usual London practice and that which it has been my fortune to meet with. One phrase he has frequently repeated has caused me much surprise and seems to need explanation. He has referred to "customary allowances for contingencies," and this even in connection with the London practice. He says the customary allowance for contingencies has increased. I cannot myself understand what he means. What would be the value of a bill of Quantities containing items such as "allow for contingencies"—introducing the element of mere speculation—when precise accuracy is essential? It has been my lot to deal with very many estimates to large amounts, and never in one instance has such an item or allowance for contingencies appeared therein. Nor have contractors themselves introduced it; in pricing out the bills the strict letter of the Quantities has always been adhered to. There may have been special advantages to be gained in dealing with materials and labour, or risks to be run, which would effect the prices of items, but never in any one case have I seen any sum put down in the way Mr. Honeyman implies. The illustration which Mr. Honeyman has given of the party-wall is exceedingly curious; the difficulty never could have arisen unless either the architect or the measurer, or both, had been so negligent or ignorant as to allow the client to be placed in such a position that a contractor should be able to claim payment for work which he had not executed. I do not think it necessary at this time to go further into the details of the Paper, because there are many portions of it with which I heartily agree. I point out particular blots, in order that Mr. Honeyman may give explanations which I am sure the Meeting will desire to hear from him, for this subject is one which is not new to the Institute. At the first Architectural Conference held in this room (in 1871), Mr. Thomas Henry Wyatt, the then President, and now our esteemed Honorary Secretary, introduced it in his inaugural address. It was discussed, and a committee was appointed to consider the question of the employment of surveyors. That committee on entering upon its labours issued a series of questions which, Sir, if you will permit me I will read. The questions, which really bear very much upon the points discussed in Mr. Honeyman's Paper, were seven in number:—

EMPLOYMENT OF SURVEYORS.

[*Subjects relating to which the expression of opinion and the communication of information was requested.*]

1. Is it desirable that the practice generally adopted in the case of large works (whereby a surveyor is appointed to represent the employer and another the builders—such surveyors being jointly responsible to the builder for the accuracy of the Quantities), should be in any way modified?

2. It was suggested as a convenient course for general adoption that the Quantities should be prepared by a surveyor nominated by the architect, and who would be responsible to the employer for his accuracy; the builder being relieved from any responsibility in regard thereto.

3. The adoption of this course would go far towards disconnecting the surveyor from the builder, and making him the agent and adviser of the employer in the matter of Quantities, &c. Would this be a system advantageous and desirable for general adoption?

4. A suggestion that the Bills of Quantities should form part of the contract was well received: architects in leading practice mentioned that they had for many years adopted such a course, and found it to work well, and to be equitable to both employer and builder. Are there any valid objections to the introduction of such a system; the dimensions on which the Bills are founded being, in such a case, placed in the hands of both architect and builder?

5. It appears to be not unusual for some architects, especially in the provinces, to furnish the Bills of Quantities for works to be carried out under their own superintendence. However convenient this practice may be in some instances, are not special precautions necessary? Should not the "Bills," in such instances, *invariably* form part of the contract? And from whom should the architect receive payment for such Quantities?

6. It was mentioned as being an ordinary and reasonable course that the responsibility of the accuracy of the Quantities should be thrown upon the builder, by fixing a time, say one month from the acceptance of the tender during which he might prove the Quantities, but after which no objection would be allowed. Might not great injustice be committed under such a system?

7. It would be desirable to secure more general uniformity of practice with regard to the taking out of Quantities. How can this be best attained?

Those questions were issued subsequently to the Conference of 1871, and they bore the signatures of Mr. Rickman and myself. Many hundreds of copies were sent out, a large number of categorical replies were received, and the committee reported at the Conference of 1872. That Report, which was founded on a careful consideration of the replies received, was sent to all the Members of the Institute, and it is as follows:—

EMPLOYMENT OF SURVEYORS: REPORT OF SPECIAL COMMITTEE, 14TH JUNE, 1872.

The wide range of the subject, and the varied opinions which had been expressed at the Conference rendered it difficult for the Committee to determine how best to proceed; after having collected a certain amount of information they prepared a series of enquiries which were circulated in the profession throughout the country, and to which sixty replies were received: these replies evince a wide diversity of opinion, arising from local circumstances and individual varieties of practice, and have satisfied your Committee that for the present it will not be practicable to lay down any fixed rule for the guidance of the architect in dealing with "Quantities." Each case must be governed by local or personal considerations, and the Committee have therefore deemed it expedient to make their recommendations and expressions of opinion so general as to meet these varying conditions.

The object to be attained by the employment of surveyors to take out the Quantities of a building is to afford the builders who are to tender, one uniform basis for competition; and to define, more exactly and accurately than can frequently be done by the general drawings and specification, the exact amount and nature of the work to be executed. As no employer should desire to obtain from his builder more work or greater value, and should not obtain less than was included in the estimate, while on the other hand he should have the greatest facility to secure due allowance in the case of omission, *it would appear reasonable* that the Bills of Quantities, which should express in an exact form the intentions of the architect as set out in his general drawings and specification, ought to form a part of the contract, and be dealt with as a recognised exposition of the responsibilities of both employer and builder.

The established practice in London in the case of large and public works by which one surveyor is nominated by the architect to represent the employer, and another by the builders to act for them, giving the construction of the work and the elucidation of the architect's ideas the advantage of the experience of two professional men, who consider each question from different points of view, has apparently for many years worked well; though in many cases the advantage derived from the engagement of two can only be considered nominal. There is an understanding that the surveyors so employed are responsible to the builder for the sufficiency of the Quantities supplied, and the general drawings and specification prepared by the architect being sufficient, the employer is guaranteed against any excess of cost, and the builder is held safe against loss from errors of quantity. On this system your Committee do not think it necessary to make further remark, although some objections have been made to it by leading members of the profession, who prefer to adopt the course next mentioned.

Many eminent architects have adopted the course of nominating a surveyor who shall prepare the Quantities on his own responsibility, and as far as the builder is concerned such Quantities become practically a part of the contract. Your Committee thoroughly appreciate the great advantages which the architect (and no less the employer) may derive from the employment of a surveyor acquainted with all the details of design peculiar to the architect and with his general manner of proceeding, and also how such an arrangement facilitates proceedings, when time is insufficient for the preparation of drawings and specification in such full detail as would be necessary if a stranger were employed as the surveyor. They are therefore of opinion that this system may in such cases be advantageously adopted, provided always that the builder be relieved from any responsibility as regards the Quantities, and that the Bills be considered as representing the work to be done. The successful working of such a system must depend entirely on the ability and position of the surveyor employed, his relation to the architect, and the extent of the confidence which the builders tendering may repose in him.

It appears to be an ordinary custom in the provinces for the architect to supply the Quantities for the carrying out of his own designs; where this is done, it should be with the knowledge and concurrence of the employer, and the Quantities should form a part of the contract. The architect accepts the duty of providing the Quantities, and should not attempt to evade his responsibility by throwing on the builder, as is sometimes done, the labour and risk of checking them, a course which your Committee believe to be unsatisfactory, and in some cases likely to lead to great injustice.

Your Committee are of opinion that the practice of making the Bills of Quantities part of the contract has not been fully considered. Recognised or not, the Quantities should be invariably referred to as the interpretation of the general drawings and specification ; and in all cases where they are supplied to the builder by the architect, or by a surveyor in whose nomination the builder has had no part and who is not responsible to the builder, they should form part of the contract. At the same time, when once it is admitted that these documents are to form part of the contract, the necessity for the employment of more than one surveyor in their preparation vanishes.

The more general adoption of Quantities, the extension to country work of the system of measurement usual in London, the gradual modification of local terms and usages and, not least, the discussions consequent on such meetings as the Conference, will all tend towards uniformity of practice ; and as builders become more familiar with the London system of measurement, and the public better acquainted with the nature and bearings of the questions as to the employment of surveyors, and both recognize, when such acquaintance increases, the special advantages to be derived from the adoption of one or the other system of employing them, architects and surveyors will find it to the interests of their employers to adopt a uniform practice.

That Report was signed by Messrs. H. Currey, C. Fowler, J. Jennings, J. T. Knowles, Wyatt Papworth, Arthur Cates, and T. M. Rickman.

Then in 1874 the subject was again relegated to the same committee, and further inquiries were made. The kind services of the Architectural Press were lent, and a large amount of correspondence took place. After full consideration, the committee found no reason to modify the views they had before expressed, and the recommendations they had made, but considered it undesirable to submit any definite propositions. Mr. Honeyman, however, comes before us with a definite proposition. It is that in place of one operation we should have two operations in respect of ascertaining the cost of a building. First of all to have Quantities taken out, and then at completion to have the building measured off. This I declare to be utterly needless, and I assert without fear of contradiction, that, if supplied with proper drawings and specification, that measurer would not be worthy of the name of surveyor who would not be able therefrom to produce a result in Quantities as accurate at the least as if they had been measured from the building. But if the drawings prepared by the architect were incomplete, and the bill of Quantities were to be taken as a sketch of the work to be done rather than an exact representation of such work, then a final re-measurement would be reasonable. There is one other consideration. What would a contractor say upon Mr. Honeyman's proposal? As it is, too often delays arise before the final accounts are made up, but if the whole of the work is to be re-measured, the delay would be insufferable, and I think the chances of errors, instead of being reduced, would be multiplied. With every desire to accept much that Mr. Honeyman has written, and which goes to a great extent to support the views of the committee, as expressed in the Report I have read, I do not see that he has shown any grounds for change in the London system, which carried out by skilful measurers, on the basis of sufficient information by way of complete drawings and specification, produces results as nearly perfect as is practicable. The system he advocates would, on the contrary, be not only an undesirable substitute, but one likely to lead to increased cost, delay and vexation.

Charles Barry, F.S.A., *Past President.*—We must all be grateful to Mr. Honeyman for having brought this subject before us ; at the same time anybody who has followed the Paper with the care I have tried to do, must come to the conclusion that a subject of such great difficulty, treated with so much thought, consideration and—as Mr. Cates has said—boldness, can hardly be discussed on a first hearing. Mr. Honeyman appears to have based his arguments, as far as the London practice is concerned, upon entirely false premisses. He has based his arguments upon the idea that quantity-surveyors appointed by architects forms the London custom. The London custom as I have always understood it is to nominate two surveyors. One is appointed on behalf of the proprietor to see that no more than sufficiently full measurements are taken in every part of the building to justify him in accepting a tender based on such Quantities so made, while a surveyor equally able is appointed on

behalf of the contractor to see that the measurements taken are not too scanty. Cases have occurred and continually occur, where there is such confidence in the probity of the profession of surveyors, —which in my opinion it thoroughly deserves,—that one surveyor is permitted to act for both parties. The architect may suggest a surveyor on the part of the proprietor to whom the contractor may not object; but if there is any doubt on the mind of the competing contractors they have their remedy; they may then appoint their own independent surveyor. I cannot imagine that a more fair system could be devised, and in my opinion it has enormous advantages—one being that which I am sure the experience of all will thoroughly appreciate, namely, the opportunity of the client knowing from the outset the sum he will be called upon to pay, at least as nearly as it can be ascertained. That is an advantage which cannot be overrated. If it were not for that, as we all know, works would not be undertaken which are undertaken; it is only on the faith of that, that three-fourths of an architect's practice is really obtained. Mr. Honeyman thinks that "in the old-fashioned system of estimating the experience of offerers came into play as a safeguard against excessive cost, but having departed from this, having abolished competition as a check on the accuracy of Quantities and made the amount of the offers to turn on the mere variety of rates, you take totally different ground and ought to be prepared for a change of aspect." But I venture to say that the variety of rates, between one contractor and another, often depends in a great measure upon the way in which they look at the work which they are asked to do. That variety may depend upon the amount of capital which one contractor can command as compared with another; or upon the amount of occupation which the staff of one contractor may at the moment have. It may be his desire to keep together a band of workmen, whom he would rather employ than keep idle, and may be content to do so at small instead of large profit. Another element in the case may be the stock of materials he has on hand or may have a favourable opportunity of purchasing. All these are honourable and legitimate reasons why, amongst a number of contractors, there should be considerable differences in the amount of the tenders submitted for the same work. Then again in the matter of extras and omissions, I cannot imagine a greater safeguard than priced bills of Quantities used to value extras and omissions, both to proprietor and contractor; they are the greatest preventive against excessive prices being put upon the work. Mr. Honeyman treated rather scornfully the idea of pecuniary recovery from surveyors for mistakes they may have made. It is in my experience not so small a question as Mr. Honeyman considers it. I have known more than one case where surveyors, who inadvertently made serious omissions in their bills of Quantities to the prejudice of the contractor, have without any hesitation paid the cost of the works omitted. Of course it would be a matter of simple honesty on the part of the proprietor to consider whether that cost should ultimately rest upon the surveyor, inasmuch as the former has the value of the work so paid for, but I know of more than one case in which proprietors have been content to accept work which has been paid for by the surveyor. In the matter of mistakes: I agree with Mr. Cates that mistakes would be more likely to occur in the measurement of a finished building, or during its progress, than in the measurement of work taken from properly-made drawings and specifications duly laid before the surveyor. Again, Mr. Honeyman says that under different circumstances contracts made through the proprietor, and therefore through his agent the architect, should have *everything* to do with the bills of Quantities, or in other cases should have *nothing* to do with them. In that I concur. I am glad that timely reference was made to the Report on the Employment of Surveyors. That Report was arrived at after an exhaustive consideration of the two modes of procedure. The one where independent surveyors are appointed in the way I have described—one by each side; the other where bills of Quantities are issued on the authority of only the proprietor or architect, and where the contractor has nothing to do with them. In the latter case I think it is

only just that they should form part of the contract, but where the London system exists it is equally just that the Quantities should have nothing to do with the contract.

Alfred Waterhouse, A.R.A., *Member of Council.*—The last two speakers have exhausted so many of the points which have occurred to me on listening to this interesting Paper, that I will content myself with asking Mr. Honeyman one question. He has not told us, in describing with some minuteness the Glasgow system, what that system costs. I think that is a most important element in the question. We should like to know what our brethren in Glasgow, or what their clients rather, have to pay for taking out Quantities, and what the measurement of the work comes to afterwards? Although I feel greatly indebted to Mr. Honeyman for his Paper, and although it has given us many matters of great interest to discuss, still it does not seem to me that the Glasgow system as now existing is exactly suited to our wants. This question of Quantities is an extremely difficult one. There is something very anomalous, as Mr. Honeyman states, in our nominating a surveyor and yet not taking the result of that surveyor's labours as the basis of the tender; and it strikes me if we would persuade our clients to take carefully prepared bills of Quantities as the sole basis of the contract, the difficulties we now so often have to contend with would be pretty much at an end. I am glad that Mr. Cates has recalled to our memory the Report on the Employment of Surveyors, because I observe that it advocates the course I would have all architects adopt.

T. M. Rickman, F.S.A., *Associate.*—I do not profess to be an authority on this subject, though I have adopted the preparation of Quantities as a branch of the profession of architecture; and I think it should not be considered as a separate profession. I had some hand in preparing the Questions and also the Report on the Employment of Surveyors, and I think they contain much well-digested thought on this subject. With regard to the Paper, there are several points in it which induce me to think that Mr. Honeyman does not thoroughly understand the working of our system in London. I disagree with Mr. Barry in considering that the system in London most largely adhered to is that of the employment of two surveyors, for I think the plan of having but one surveyor is coming more into vogue. On the other hand there is an advantage in having two surveyors for very large buildings, such as may cost £200,000, the direct pecuniary responsibilities of which are more than any ordinary professional man should have to bear; and I think it is the duty of the professional man to keep as clear of responsibilities of this kind as possible, whilst he should have his own affairs thoroughly in hand. There is a difference between the Glasgow and north-country system and that adopted in London. The system I have seen is to measure each item complete as it is to be put into the bill: for instance, the number of rods of brickwork is ascertained before the masonry is touched, and the several openings either in carcase or finishings are not kept separate. The bills are thus written as the dimensions are taken; and it is most difficult from such a bill to ascertain the value of any variations that occur. London Quantities are, however, generally so prepared as to be applicable to any variations that happen in the course of the work, so that, however much a client may alter his mind or the architect change his details, no more measurement shall have to be gone through at the completion than may be necessary to pick out the particular item which has been varied; and this part of the business of the surveyor is thus got through with as little expense as possible to the client. As regards one of the suggestions in the Paper, I think the measuring surveyors of London would hardly be content to become licentiates of the Institute. It is becoming a not uncommon thing for a measuring surveyor to be appointed under the arbitration clause of a building contract in preference to a Fellow of the Institute.

Thomas Chatfeild Clarke, *Fellow.*—There is one remark worthy of consideration with reference to the question whether the Quantities should form part of the contract. I believe I may

say that several large building firms in London are in favour of that course, and the fact ought to be a note of warning to architects. With regard to the general question, I feel, with Mr. Waterhouse, that Mr. Honeyman has not given us data on which to draw a full comparison of the Glasgow with the English system. If you pay a quantity-surveyor 1½ or 2 per cent. for taking out Quantities, and another 1½ or 2 per cent. for measuring at the end of the work, you create a large extra cost upon the building; and it is for us to consider in what way our clients would look at that fact. If clients are told the result of a tender is uncertainty, they might take alarm; and they generally care only to be assured of what the real amount will be. If you go into the question of Quantities and leave in their minds an element of doubt as to the result, I believe, in many cases, they would rather not have the work done at all. Therefore, before we endorse any special view of this matter, we ought to pause. I think it would be premature in us, as the Institute of Architects, to express any decided opinion, on a necessarily short discussion, in favour of the incorporation of the Quantities as part of the contract. It is a thing which I have myself studiously avoided, and in my own practice I have scarcely had any legal difficulty in finally settling the contract.

The PRESIDENT.—The Paper deals with an essentially practical subject, and one that involves many phases. It is open to a large variety of opinions; and details which may at first sight appear small and insignificant really bear broadly and widely upon the relative relationship of proprietor, architect, quantity-surveyor and contractor. In the Discussion which has taken place, some of the suggestions and objections I had to make have been anticipated; and time only remains for Mr. Honeyman to make such replies as he may think necessary to the questions which have been put to him by the several speakers.

JOHN HONEYMAN, *Member of Council*.—My friend, Mr. Arthur Cates, has thought that some of my remarks upon surveyors were rather severe; but it must be remembered that my remarks do not apply to London alone: my remarks applied to the whole kingdom. While I entertain the highest esteem for every surveyor with whom I ever had anything to do, it is necessary, when dealing generally with a matter of this kind, to face the possibility of dishonesty in surveyors; although I may be quite prepared to admit that there are no more dishonest surveyors than there are dishonest architects. I think Mr. Cates hardly understood my meaning when speaking of contingencies. Contingencies may be charged, I apprehend, without being specifically mentioned. In Edinburgh schedules they are mentioned, and the contractor fills in what he thinks proper under that heading; but he also adds from 10 to 15 per cent. to his prices, as I explained, and that I also regard as a charge for contingencies. He adds, because he is not quite sure if he will get paid for all that he does. If the work is to be re-measured, he does not add, for in that case he is sure that he will be paid for everything. Other circumstances affect such contingent percentages. From what Mr. Barry has said, it is evident that I have been under a misapprehension as to the general prevalence in London of the practice of employing two surveyors, one being appointed by the proprietor and the other by the intending offerers. I certainly thought that that practice had been superseded to a much greater extent than appears to be the case. But, while the practice in question undoubtedly ensures greater accuracy, and makes it extremely improbable that any errors should occur, the difficulties and anomalies I have pointed out remain,—they are only mitigated. Besides, I must again remind you that I was endeavouring to deal with the existing state of matters generally throughout the country; and, bearing this in mind, you will agree with me, I am sure, that while the guarantee of a first-rate London surveyor may be perfectly satisfactory, it would be vain to think of the guarantee of surveyors generally as anything of the kind. With regard to the party-wall to which I referred, the contractor was not obliged to have the work re-measured; but he believed so many

things had been omitted or inadequately measured in other parts of the buildings, that it would be better for him to have the whole—wall and all—re-measured, and so he agreed to that course. The cost of measuring and re-measuring work in Glasgow varies somewhat, according to the difficulty of the work. It is sometimes done at $1\frac{1}{2}$ to 2 per cent., sometimes 3 per cent., and even more; but the great bulk of the work is done at $2\frac{1}{2}$ for both. The better class of surveyors take out the quantities with great minuteness, so that the cost of the building is exactly ascertained at first. I cannot expect the merits of the Glasgow system to be readily appreciated by those who are unaccustomed to it; my object to-night, however, is not so much to recommend it as to condemn the issuing of bills of Quantities without accepting the responsibility of doing so, and without regarding them as the basis of the contract. If you come to do this generally, you will perhaps find that you cannot stop short of re-measurement; but that may be left as a question for the future. Mr. Rickman has no doubt correctly described the existing relations of architects and surveyors in London. He certainly ought to know. The situation, however, appears to me to be ridiculous and altogether wrong. It very strongly confirms me in the opinion that some re-adjustment of this relation between the architect and the quantity-surveyor is called for, so that the surveyor may be kept in his proper place and the architect maintain his.

IX.—THE RECENT EXCAVATIONS OF THE ROMAN FORUM.

By Edward I'Anson, F.G.S., *Member of Council.*

Mr. President and Gentlemen,—Although the subject of the Roman Forum has been more than once discussed in this room, still it is ever replete with interest, and as the excavations which have been going on during late years have disclosed facts and settled questions which have been matters of voluminous controversy amongst antiquaries and literary men for generations, I now propose having recently seen these excavations to describe their present condition.

I am neither an antiquary, nor versed in classic lore, so that all I propose to do is to record what I observed, and to note the conclusions which others have drawn from the facts disclosed.

When I first visited Rome my knowledge of the classic monuments it contained was derived from Taylor and Cresy's book, two interesting folio volumes, and such information as the Guidebooks afforded, for it was before either the days of Murray or the learned observations in Bædeker's Handbook that I paid my first visit.

At that time the Roman Forum was a plain extending from the base of the Capitol to the Colosseum, and the monuments then visible consisted of the upper portions of two groups of columns known as the remains of the Temple of Jupiter Stator, now determined to be the Temple of Castor and Pollux,* one group of Ionic columns, a considerable part of the podium on which they stand, and one single column which had been excavated to the base by the Duchess of Devonshire in 1813, and in Byron's time was called the nameless column with a buried base. Besides these there was the triumphal arch of Septimius Severus at the north-west end of the Forum, and this was all.

I will now endeavour to describe to you the Forum as I saw it last November and December. Beginning, then, at the north-west end of the Forum we find a large building constructed on the south-eastern slope of the Capitoline Hill; much of the lower part which is ancient remains, it has been raised upon by Michael Angelo, and is now incorporated with the senatorial palace, of which the principal façade is in the Piazza del Campidoglio. The façade next the Forum, is a very lofty and conspicuous object, forming a considerable part of its north-western boundary. In this building was a long arcade, one arch of which is now open with Doric half columns at the sides, and the capitals of several other columns and considerable traces of the cornice indicating the continuation of the arcade may be seen embedded in the walls. By an inscription which existed until the 17th century, this building is known to be the Tabularium or Public Record Office, and its destruction by fire is twice alluded to by Cicero. It was rebuilt by Quintus Lutatius Catullus, Consul, B.C. 78, though some portions must be of more ancient date, being built of tufa. The lower and ancient part now used as a museum for the reception of the architectural gleanings arising from the excavations of the Forum, is still in excellent preservation, although a portion used during the middle ages as a storage for salt has been much injured by its corroding action on the tufa stone. Above the ancient part is reared the lofty buildings added by Michael Angelo. On the south-west side of the Tabularium is the principal road leading from the Capitol to the Forum called the Clivus Capitolinus.

On the north-east side of the Forum under and against the Tabularium are the remains of the

* See the "Roman Forum," a Topographical study by Francis Morgan Nichols, M.A., F.S.A., pp. 97-110. (Longmans & Co., 1877). Mr. I'Anson has largely quoted from Mr. Nichols's valuable work.

Temple of Concord, the extensive podium of which, with its rich marble pavement, and some portion of the outer walls with their marble lining and plinth, still remain, particularly next the western angle. The building of which we see the remains appears to have consisted of a large cella placed against the wall of the Tabularium with a portico of less width projecting towards the Forum, the portico being approached by a lofty flight of steps, though none of the columns are left remaining.

When Varro wrote there seems to have been not only a Temple of Concord but a basilica called the Basilica Opimia on this ground, and in earlier times in the same locality a building called the Senaculum also stood. Some antiquaries I believe now consider that this ruin did consist of two separate buildings.

The first Temple of Concord placed on part of this site was probably that of M. Furius Camillus, B.C. 367. The temple existing in the time of Cicero and Varro appears to have been erected in the Forum by L. Opimius, Consul B.C. 121. The edifice of which we see the present remains was, it is believed, undertaken by Tiberius during the reign of Augustus, B.C. 6, and dedicated after the triumphal return of Tiberius from his German campaign, A.D. 12. This temple was frequently used for the meeting of the Senate; it was to this place Cicero brought the accomplices of Cataline, and here he exposed the conspiracy, whilst the Clivus Capitolinus was thronged with the noblest of Rome. It was here that Cæsar was threatened by the Roman knights, and it was here after Cæsar's death that Cicero and the Senate defied Mark Antony.

The base of the Temple at the southern extremity is composed of rubble masonry; then follows a rubble wall, and at a still higher level is a mass of stone rubble work, forming no doubt the substructure of the steps leading from the level of the Forum up to the floor of the Temple.

Where the cella appears to have joined the portico are two large massive stones which apparently formed the cill of the door or doorways either of the cella or of two separate buildings. On the northernmost of the two cills are two deeply recessed mortice-holes as though to receive the pivots or studs on which the door turned, and on the other cill is the matrix of what appears to have been a figure of the Caduceus probably in bronze. The cella of the Temple (or if it were so the separate building next the Tabularium) is covered with marble paving, but the whole is much fractured. The back wall does not touch the wall of the Tabularium, but there is a small space between the two buildings. There are considerable traces of the marble lining of the walls at the south-west corner, and there are also ruins of a brick construction, the remains of a church of the middle ages built within the area of the ancient Temple. The wall of the Tabularium at the back or close to the back of this Temple is an excavation through an ancient doorway, made as I understood at the expense of the veteran English archæologist, Mr. Parker, in order to ascertain whether it formerly communicated with the interior of the Tabularium. The excavation, however, does not lead to this conclusion. In front of the ruin of the Temple of Concord stands the arch, which appears from its inscription to have been erected in honour of the Emperor Septimius Severus and his sons Caracalla and Geta, but from which the name of the last was erased by order of Caracalla. The carriage way between the Temple of Concord and the north-west front of the arch of Septimius Severus is part of the ancient road leading from the Clivus Capitolinus to the prison, but the road branching from it and passing under the arch is probably not older, if indeed so old, as the arch itself. The Via Sacra runs steeply up to the arch of Septimius Severus, and just within the modern roadway is a large altar base and a square altar. The north side of the arch is very ruinous, and there are several mortice-holes for the insertion of timber, but the south side of the arch is in much better preservation. The central roadway through the arch is paved, and after passing through, it turns

sharply to the south-west; the paving is very dilapidated, and the footways through the arch are paved with square stones not very regularly laid. Beyond, and north-eastward of the arch, are some remains, which are supposed to be those of the equestrian statue of Marcus Aurelius, now in the Piazza del Campidoglio, certainly one of the finest, if not the very finest, equestrian statue in the world. At the western corner of the arch, in front of the Temple of Concord, is the nucleus of a tall, circular structure about 15 feet in diameter, supposed to be the Umbilicus Romæ. Commencing from the Umbilicus Romæ is a platform on a level, or nearly so, with the ground next the Capitol, but with a perpendicular face about 10 feet high, forming part of a circle towards the Forum, which face has been cased with marble. On this face there are several projections and the remains of copper cramps, to which some antiquaries, and amongst others Canina, considered the rostra of vessels were affixed. Part of this monument is still covered by the modern road carried on a higher level by arches, and which here traverses the Forum in a south-westerly direction. Returning to the wall of the Tabularium we find, separated from the Temple of Concord by a passage of about five feet in width, the remains of a Temple, three of whose Corinthian columns still support the north-west corner of the entablature of the portico, inscribed with the letters "Estitver." This Temple which, like all the others in the Forum, stands on an elevated podium faced towards the Forum, and concealed a portion of the loggia of the Tabularium.

Before its southern corner on the other side of the road which passes in front of it, is the nearly perfect Ionic hexastyle portico of another Temple, having its façade at right angles to that of the Temple last mentioned; upon the entablature of the Ionic portico may still be read the complete inscription, "Senatus populusque Romanus incendio consumptum restituit." Under the cella of the Temple are considerable remains of vaulted chambers; in front is a ruined terrace where the steps of the Temple must have been, and round which the Clivus Capitolinus is carried at a steep incline, continuing its upward course along the north-western side of the Temple.

The two Temples last described are now agreed to be those of Vespasian and Saturn. Antiquaries have differed very much as to their identity, but modern opinion has generally concurred with Canina in ascribing the Ionic Temple to Saturn. For this conclusion there seems to be full and sufficient reason, and assuming it therefore to be correct, it necessarily follows that the Corinthian Temple, formerly called the Temple of Jupiter Tonans, was that dedicated to Vespasian; it was probably built in the time of Titus and appears to have been restored by the Emperor Severus. In the wall of the Tabularium behind this Temple is a doorway which was built up in ancient times and further concealed by the construction of the Temple; it gave access to a staircase which is still preserved and led to the upper floors of the Tabularium without any communication with the lower storey.*

The age of the Temple of Saturn was a much disputed question with the Roman antiquaries; Macrobius says it was dedicated by King Tullus Hostilius, while Varro asserts it was begun by Tarquinius Superbus and dedicated by Titus Lartius, the first Dictator, B.C. 501; Dionysius attributes it to the Consuls of the year B.C. 497; Gellius attributes it to L. Furius, Military Tribune, B.C. 381; but all agree in carrying back its original construction to a remote date. The Temple was rebuilt in the time of Augustus by Munatius Plarcus, and though the existing portico is evidently a late and clumsy restoration, it would appear that the character of the building in the time of Trajan was as we see it now. The Temple of Saturn was the treasury of the Roman government and the military standards were kept there. It was into this Temple that Julius Cæsar made a violent entry for the purpose of taking possession of the treasure of the State.

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* See Mr. Nichols's "Roman Forum," p. 27.

Between the Temple of Saturn and the Tabularium is a terrace at a level considerably above the Forum, having at the back a long portico or colonnade built in part against the Tabularium and in part against the retaining wall of the Clivus Capitolinus which is here above it; behind the colonnade is a series of small cells. The colonnade has been much restored I believe by Canina, and by the restored inscription on its entablature it appears that it once contained images of the twelve Di Consentes placed here by Vettius Agorius Prætextatus, prefect of the city, A.D. 367; but this in all probability was a restoration of a much earlier shrine, containing, as mentioned by Varro, twelve gilded images, six of the gods and six of the goddesses.

At the level of the road below, and approached by a narrow passage on the south-west side of the Temple of Vespasian, is another series of cells or chambers, which are supposed to have been waiting rooms or offices for notaries or the clerks or criers of the ædiles; they are called Schola Xantha, a name first found in the apocryphal account of the regions of Rome which passes under the name of Sextus Rufus.

The lane running between the Temple of Saturn and the Basilica Julia was the Vicus Jugarius, running from the base of the Tarpeian Rock to the Forum.

The whole of the south-western side of that part of the Forum called by some authors the Mid-Forum, is bounded by one of the sides of the Basilica Julia occupying a rectangular space of about 400 by 160 feet; the enclosure was formed by an arcade of which there are considerable remains at the west corner, where owing to the rapid rise of the ground next the Vicus Jugarius, this corner of the building was constructed against the sides of the hill, and, having become buried by the falling of the hill side, has been better preserved to us than the other portions. Abundant evidence however has been found amongst the fragments of the building to enable a restoration to be made of part of the enclosing colonnade. This has been done by Signor Rosa, who has also caused brick piers to be built indicating the position of the piers of the entire building.

Antiquaries seem to be quite agreed that this edifice was begun by Julius Cæsar and finished by Augustus, who afterwards rebuilt the original edifice on a more extensive scale after the destruction by fire of the first building. The honour of this restoration was attributed by the Emperor to his grandsons and adopted sons Lucius and Caius, and the Basilica for a time was known by their names; it was repaired in the second century and underwent some restoration in the reign of Dioclesian, but the architectural features of the building of Augustus appear to have been preserved.

This Basilica was the court of the Centumviri, which had, in the time of the younger Pliny who practised before it, not less than 180 *judices*, and it is mentioned by Dio as one of the places in which the Emperor Trajan sat to administer judgment. It was surrounded on three sides by streets: on the north-west the Vicus Jugarius already referred to; on the northern side was the principal street, part of the Via Sacra, which traversed the Forum in the direction of its length; and on the south-eastern side it is bounded by a street identified as the Vicus Tuscus, which is known to have led from the Forum to the Velabrum and where now stand the church of St. Giorgio in Velabro, lately become more known to us as being connected with our English Cardinal Newman. This street vies with the Via Sacra in its frequent mention by ancient writers and in its religious character: being the route taken by the great processions on the occasion of the Ludi Romani in which the statues of the gods were carried in cars from the Capitol through the Forum to the Circus Maximus at the back of the Palatine Hill.

The Vicus Tuscus had also the character of a busy and fashionable tradesmen's quarter, and was considered as the Bond Street of Rome; in later times it was called Vicus Turarius, apparently from the spice shops which were situated there. In the time of Plautus the neighbourhood of this

street and the district behind the Temple of Castor had a bad reputation as the haunt of rogues and infamous persons.

The remains of a ruined pedestal, about 10 ft. by 8 ft. have been uncovered at the north-east corner of the Basilica—probably the remains of the pedestal of Vertumnus.

The whole of the Basilica Julia is covered with paving, that of the arcades being of Travertine stone, and the centre portion with yellow and black marble all perfectly level but much crushed and fractured; the paving of the arcades has been largely repaired.

On the pavement of the arcades, especially on the north east next the Forum, there are many inscriptions and also a number of rudely incised figures, most of them being circles variously divided—one I noticed being rectangular in form. These are supposed to have been made by boys for playing games; there are also rude imitations of other objects, one intended to represent an owl, one a branch of a tree and other subjects.

Opposite to the Basilica on the north-eastern side of the Via Sacra formerly stood the Tabernæ or shops of the Forum, originally founded by King Tarquinius Priscus; they were naturally then required for the trades generally carried on in a market place, hence the butchers' stalls, from one of which Virginius took the knife to stab his daughter. The schools for children were also among the shops in the Forum, and it is said to be there that Appius Claudius first saw Virginia reading.

In ancient times there appear to have been two rows of these shops at first used for general market purposes, but afterwards more particularly as jewellers' shops; no doubt very shallow, like the shops on one of the bridges at Florence or on the Rialto at Venice, or like the pantiles at Tunbridge Wells. They were standing in the times of Cicero and Livy, but they were burnt down shortly after the death of Agrippa, B.C. 12; and it may be doubted whether what was then destroyed was ever rebuilt, as we now find seven low brick piers about thirteen feet square, supposed to be the remains of pedestals on which statues or columns were placed.

Some fragments of statues have been found amongst the excavated ruins which it is asserted are parts of statues formerly placed on these pedestals; if so, they must have been quite small and probably numerous.

In the open spaces of the Mid-Forum, near its most western side, is the monument of Phocas, consisting of a Corinthian column which long stood partly buried in the Campo Vaccino; it was supposed until 1813, when its base was excavated, to be the remains of a Temple. It was then found to stand on an isolated pedestal mounted on a broad square base of tufa masonry and brickwork; and the pedestal bore an inscription which shows it to have been erected A.D. 608 by the Exarch Smaragdus, in honour of the Emperor Phocas, probably the last of the triumphal buildings erected in the Forum.

Near the eastern corner of the base of the column of Phocas is one of the most interesting monuments which have been discovered during the recent excavations in the Forum. It consists of two marble slabs, placed parallel to each other, and about 9 feet apart. Some Antiquaries suppose that their use was to form a gangway through which those coming to vote could, as they passed in single file, deposit their voting ticket. They were discovered in 1872. The outside of each slab is carved with bas-reliefs of a very fine character, and the slabs are not greatly injured on the inside. On the inside of each slab the same subject is represented, namely, a bull, a sheep and a pig, prepared for the *Suovetaurilia*. The sculpture on the external faces represents two scenes, which are differently described by antiquaries—one attributing them to scenes in the life of Domitian, another to scenes in the life of Titus (and this seems to be the most accepted explanation), and another to scenes in the life of Septimius Severus. However, these we may leave for antiquaries to discuss and

settle, and proceed to describe what has the more special interest for us, namely, the backgrounds of the two bas-reliefs; and this I propose to do in the words of the author I have already so largely referred to.

"When we turn to the backgrounds of the two bas-reliefs, we find that they both represent the scene that was in reality before the spectator, the Forum Romanum; and in this lies the important topographical interest of the sculptures.

"The locality of the Burning of the Registers is most easily recognised, and may be conveniently taken first. In the foreground, to the left of the spectator, is a fig-tree, and next it a statue on a pedestal. In the background, behind the figures, were five arches of a building divided by piers with half-columns, or pilasters of the Tuscan order. At a short distance from the end of this building is a hexastyle Ionic portico with a pediment. Then, after a short interval, through which an arch is seen in the further distance, is another hexastyle portico and pediment with Corinthian columns. A part of the bas-relief to the right is lost; but in the foreground is a portion of the rostra upon which the Emperor was seated. In order to identify the scene it is only necessary for the spectator to turn from the sculpture to the ruined buildings before him. In the Corinthian columns of the Temple of Vespasian he will recognise the remains of the Corinthian portico, in the portico of Saturn the Ionic portico of the bas-relief. The arch seen in the distance between the two porticoes would probably be a part of the loggia of the Tabularium. The long line of arches with piers between them will be found in the Basilica Julia, with its ornaments of Tuscan architecture. The whole of the background may thus be explained by the aid of the ruins which remain. Of the objects represented in the foreground no distinct traces are now to be seen. They consist, as has been mentioned, of the rostra to the right and a fig-tree and statue to the left.

"On the other bas-relief, which is more perfect than the first, the same statue and fig-tree are seen in the foreground on the right, and next to them, behind the figures, are seven arches with intermediate piers, similar to those of the first sculpture. Then, after an interval of some width, is a Corinthian portico, which is represented as having five columns; and finally, to the left, an arch which appears nearer to the spectator than the portico. In the foreground are the rostra from which the Emperor is speaking.

"It will be observed that in the foreground of each sculpture we have the rostra on one side and the statue and fig-tree on the other, but in one representation the rostra are on the right, in the other on the left. In the two scenes the spectator is supposed to be placed on different sides of the rostra; but in both cases the statue and fig-tree are seen in the same relative position, or nearly so,—the tree to the left of the statue. In order that these two objects should be so seen from the right and left of the rostra we must suppose both of them to have been before the rostra at about equal distances from it. Thus, though the spectator has changed his position from one side of the rostra to the other, his situation with reference to the statue and fig-tree remains nearly as before; and, as the one sculpture ends with those objects on the left, and the other begins with them on the right, the background of buildings behind these two objects in the second sculpture may be expected to begin at about the same point where it terminated in the first. With this clue we find in the piers and arches of the second bas-relief a continuation of the long colonnade of the Basilica Julia. In the wide interval to the left of the basilica the portico of the temple of Castor might be expected to be seen; but the artist has not thought fit to introduce this monument, possibly because hidden from the rostra by some nearer objects. In the portico with the Corinthian columns we may recognise the Temple of Divus Julius, the podium of which has been recently excavated, and which is represented in medals of Augustus and of Hadrian with a tetrastyle Corinthian portico. The five columns may be

assumed to be a mistake, as this form of portico is unknown. The arch behind the rostra was probably that of Augustus, of which we have some obscure mention as standing near the Temple of Julius.

"The explanation here given of the first background (in which the Temples of Vespasian and Saturn appear) agrees with that of Signor Brizio. In the other background that learned antiquary thought we might find the Basilica Æmilia and some other buildings of the north-eastern side of the Forum. This opinion was founded on the supposition that the two views were taken in opposite directions, a supposition which is contradicted by the similar relative position of the statue and fig-tree in both scenes. The two sculptures are in fact united by the recurrence of these objects, and present us with a partial panorama, comprehending the south-east, south-west, and part of the north-west side of the Forum, as seen from the neighbourhood of the rostra.

"We may now turn to the identification of the objects in the foreground. Among these are the rostra of the Forum. The removal of this monument from its site at the edge of the Comitium, where it stood till the time of Cicero, is testified by Dio and Asconius; but its subsequent position has not been ascertained, except so far as the sculpture before us enables us to do so.

"The statue seen in both the bas-reliefs represents a figure nearly nude, but shod with a sort of loose boots. On his left shoulder he bears a full wine-skin, and his right arm, which is lost in both sculptures, appears to have been raised in the air. This figure has been recognised as that of Marsyas, who is represented with the attributes of a satyr or Silenus, a character ascribed to him by Herodotus and Pausanias."*

To those who desire to carry further the inferences which Mr. Nichols has arrived at, I refer them to the second chapter of his book. He concludes that these bas-reliefs enable us to determine with accuracy the position of the equestrian statue of Domitian, the Lacus Curtius, the statue of Marsyas, and the rostra, but excepting the ruined base of the equestrian statue no trace of any of the other monuments remains.

On the north-eastern side of the Forum may be seen some traces of the ancient Via Sacra.

The south-eastern end of the Mid-Forum is bounded by a cross road extending from the north-western corner of the Temple of Castor and Pollux in a north-eastern direction until it joins the Via Sacra.

Before leaving the Mid-Forum, I should refer to the Cloaca Maxima, which is in part uncovered, and can well be traced passing under the Basilica Julia, and obliquely, nearly in a northerly direction, until it is lost under the still unexcavated bank on the north-eastern side of the Forum.

The surface of the Forum, as we now find it, is paved where it was intended for the use of carriages with large polygonal blocks of hard grey volcanic stone, called by the ancients silex, although its composition in fact does in no way correspond with the meaning of this term as used in science; and where it is intended for foot passengers only, with rectangular slabs of travertine stone. The ruts caused by the chariot wheels, as at Pompeii, are very noticable, especially at the sharp turn of the road at the corner of the Temple of Castor, and from some cause which I find it difficult to explain, the stones—and it is the same at Pompeii—are worn away at the joints, so that each stone presents a convex surface; at one part of the roadway, near the bottom of the Clivus Capitolinus, is a more perfect portion where the joints are well squared, apparently more recent and less worn, and where the rounding of the edges is not perceptible.

Adjoining the Vicus Tuscus, at the south-eastern end of the Forum, are three Corinthian columns

* See Mr. Nichols's "Roman Forum," pp. 65-70.

which formed one of the land marks of the Campo Vaccino, formerly known by the name of Jupiter Stator. Canina at one time considered them as part of the Curia Julia, but they are now generally recognized as the Temple of Castor and Pollux. The Temple of Castor—originally dedicated B.C. 482—was rebuilt by L. Metellus Dalmaticus B.C. 119; and whatever may have been the character of the original Temple, the edifice of Metellus was one of considerable size and importance, and was frequently used for the meetings of the Senate. This Temple was amongst the numerous public edifices which were rebuilt in the time of Augustus; this was done by Tiberius, in his own name and that of his brother Drusus, out of the spoils of the German campaign, and although dedicated to two divinities it generally bore the name of Castor only. About twenty feet from the eastern corner of the steps of the Temple of Castor are the remains of a low round construction, apparently a basin of water, which is probably the Lake of Juturna, and the pool or spring referred to in early story at which Castor and Pollux gave water to their heated steeds after the battle of the Lake Regillus. A little further east is the ruined podium of a circular building, which is supposed to be the remains of the Temple of Vesta, but authorities, as usual, differ on this point. The age of the Temple which existed in the time of Augustus, and which was then covered by a bronze dome, is unknown—it was burnt down in the great fire of Nero, and was probably rebuilt by Vespasian, but again burnt down during the reign of Commodus. The Temple must, judging from the size of the ruins of the base, have been quite small, and the fact of its having been, in the time of Augustus, covered by a bronze dome seems to strengthen this conclusion. On the southern side of the Temple are some ruins half hidden in the still unexcavated bank; they probably occupy the site of the houses of the Vestal Virgin.

I have endeavoured to note the position and present condition of these ruins which cover and surround the Forum, giving only so much description as seems necessary to identify them. The plans I have put before you are enlarged from those of M. Ferdinand Dutert, Ancien-Pensionnaire de l'Académie de France at Rome, and the illustration which accompanies this Paper is a reduced copy of part of the plan which accompanies his Memoir.

Nothing is I think more striking, considering how large a portion Roman history fills in the history of the civilised world, than the small area within which the scenes of this history were enacted. The Forum of Rome was the focus of all, and the Forum of Rome is not actually larger than Lincoln's Inn Fields. The Via Sacra through which we are told the Emperors of Rome passed —followed by captive potentates—with the trophies of victory and long trains of armed warriors and slaves; where, on their way to the Capitol, the victorious Emperors proceeded to solemnize their triumphs with religious rites—and the captive Kings were led to their prisons; where the great annual religious processions of the people, carrying their images and their gods, passed on their way to the Palatine Hill: this great thoroughfare of Imperial Rome was only twelve feet wide.

Here my Paper ends, but before I conclude I would refer to the kindness of Signor Rosa, who is entrusted with the superintendence of the excavations of the Forum. He has been very kind in accompanying me personally over the scene of his labours and in showing me some very elaborate plans he has prepared. He proposes to publish these, and I believe they were expected to appear in January last; they are accompanied by learned references, and when published cannot fail to interest us all.

No 12.

9th June, 1879

ROMAN FORVM: ACTVAL CONDITION

Scale of Ft. 0 50 100 Feet

Whiteman & Bass Photo Litho London

DISCUSSION.

Professor DONALDSON, *Past President.*—I would venture to draw attention to the three columns of the Temple of Jupiter Tonans behind which is the Tabularium. A few years before I was there the earth had accumulated in the area of the Forum to such a height that only the upper part of these columns could be seen; the excavations were begun by the French on the raised mound, but it was found that the columns leaned over, from the pressure of the earth, towards the Tabularium, and it became a question how to prevent their being destroyed—how to restore them to their original perpendicular position. The pressure of the soil had gradually made the columns lean back and the earth had got into the joints of the columns; the way to get them perpendicular was by cleaning out the grit from the joints, and by that means the columns became of themselves perpendicular again. Shortly before I was in Rome the excavation near the arch of Septimius Severus was made, which brought out the entire column of Phocas half embedded in the ground. Great diversity of opinion previously existed amongst antiquaries as to what it was, but in order to settle the question the Duchess of Devonshire, at her own expense, had the earth removed, and then it was found that the column thought to belong to a Temple, was a commemorative pillar with pedestal and steps, and with an inscription, thus resolving the anxieties of the antiquaries of that period. It is possible to conceive how the Forum has been obscured by the accumulations of earth when the great depth of accumulation opposite the Temple of Antoninus and Faustina is examined. This seems but a few feet from above the natural level of the ground, but there it was originally very high above the level of the ancient roadway with a lofty flight of steps leading up to the portico. Three columns opposite the Temple of Antoninus and Faustina were excavated at the time I was in Rome, and a very beautiful restoration of the Temple was made by M. Caristie, a friend of mine. It was a magnificent Temple of the Corinthian order, the base of the columns were twelve or fifteen feet above the level of the Forum; the approach to it was in the road leading under the arch of Titus on to the Colosseum.

E. C. ROBINS, F.S.A., *Fellow.*—Mr. I'Anson has avoided controversy, and has not alluded to the difference of opinion between Mr. Parker and others, as to the respective sites of the Temple of Saturn and that of Vespasian. Mr. Parker is of opinion that the Temple with the podium and three Corinthian columns situated next to the Temple of Concord, and usually denominated Vespasian's, is the Temple of Saturn; it stands on the site of an older Temple, at the rear of which is a door now closed, which he thinks led by a flight of steps on the other side of the wall of the Tabularium direct to the Ærarium. And he thinks that the podium and seven Ionic columns, situated at right angles to the other two buildings, is the Temple of Vespasian and not the Temple of Saturn, as it is generally considered, saying that there are no vaults there to answer to the Treasury—a statement I cannot reconcile with the gaping vaults I saw there, and which may be seen also in the photographs exhibited on the walls.

CHARLES FORSTER HAYWARD, F.S.A., *Fellow.*—Perhaps Mr. I'Anson will be good enough to inform us as to what further excavations are going on at the present time, either in the Forum or elsewhere. I myself look back to the state of the Forum twenty-five years ago, when the arch of Septimius Severus had but recently been cleared out and the pavements shown; as I have not had any opportunity since of making further acquaintance with the great city, I can only judge by the magnificent photographs before us the great extent of more recent excavations by the difference in the views from what one used to know as the Forum of Rome.

T. E. C. STREATFEILD, *Associate.*—I think it has just been mentioned that the marks of chariot wheels can be seen under or near the arch of Septimius Severus. Is it not a question whether chariots passed under this arch? There was, I believe, a law prohibiting chariots from passing along the Via Sacra; and it is curious that at the eastern or further end of the Forum the marks of wheels are plainly visible, turning to the right and left at the corner of the Temple of Castor and Pollux, but they are not seen beyond this point on the Via Sacra itself in the Forum. At the triumphal arches one seems to get rather into a fog as regards the roads and where they lead. At the back of the arch of Septimius Severus there seems to be a road leading in a north-easterly direction, towards the Forum of Trajan. Then again the Via Sacra seems to turn slightly at the end of the Forum, towards the Temple of Antoninus and Faustina, and goes thence in a direction not towards the arch of Titus, but towards the Temple of Maxentius, or, as it is also called, the Basilica of Constantine, where there must have been another turning to lead to the arch of Titus.

EDWARD I'ANSON, F.G.S., *Member of Council.*—Yes, there are steps under the arch of Septimius Severus, and also inclines along which chariots could go—the road through the arch leading to the Via Sacra. With respect to further explorations of the Forum, I understand that the Roman Government have bought the houses on the north-eastern side of the Forum and other buildings, including the site of the ancient prison, where it is supposed that large remains of buildings exist. The excavations have now been carried up to the base of the Temple of Faustina, and they are being extended in the direction of the Colosseum. As the President has supposed, the excavations are made principally at the cost of the Roman government. Mr. Parker has, however, spent large sums in his researches. He, in some matters, differs in his views from other antiquaries. In conclusion, I must again remind you that Signor Rosa, our Hon. and Corresponding Member, has prepared a very beautiful plan, taken at the pavement level of the Forum; I trust that a copy may be procured, and our Library enriched by this valuable addition to the Archæology of Rome.

X.—PRESENTATION OF THE ROYAL GOLD MEDAL, 1879,

To M. le Marquis de Vogüé, D.C.L., *Hon. and Corresponding Member.*

The President.—Gentlemen,—It is my high privilege as your President to present the Marquis de Vogüé with the Gold Medal annually given by Her Majesty the Queen, and necessarily the highest honour in the power of the Royal Institute of British Architects to bestow on any gentleman, be he Member of the Institute or not, be he an Englishman or a subject of another and friendly nation. It is right that I should explain how the award was conducted. The Council, on the motion of Mr. James Fergusson, recommended that the Medal for the current year be offered to the Marquis de Vogüé, then Ambassador of France at Vienna; their recommendation, which was unanimous, was unanimously accepted by a Special Meeting of the general body of Members, convened on the 10th March last, and the Royal assent, shortly afterwards solicited, was graciously accorded in a letter written from Buckingham Palace stating that the Keeper of the Privy Purse, having submitted our award to the Queen, was commanded to notify Her Majesty's approval of it.

It may perhaps be convenient that I should describe the origin and intention of this Royal Gift, for though the proceedings connected with it date back no further than about thirty-two years little is now known of the trouble taken and the interest shown, not only by the President and Council of those days but by the late Prince Consort, to ensure the success of a distinction both professionally honourable and artistically advantageous. It was in March, 1847, that the Council resolved to humbly request the Queen to permit "the Royal Medal to be conferred on such distinguished "architect or man of science of any country as may have designed or executed a building of high "merit, or produced a work tending to promote or facilitate the knowledge of architecture or the "various branches of science connected therewith;" and with this resolution in his hand the late Earl de Grey, our President, went to the Prince Consort, who authorised him to say that the Prince fully approved of the proposal and also that the Queen would sanction it. The Prince stated his opinion that the award of the Medal should be varied in each succeeding year—that it should be applied as the Council of the Institute might periodically feel to be best for the general welfare of the profession; and a few months later the Prince Consort gave further proofs of the interest he took in the matter. When Mr. Wyon, the late well-known Royal Academician, submitted a design for the reverse of this Medal, he was informed that the Prince Consort wished the Medal to clearly show that it was the Queen's Gift, and he suggested that, on the obverse, the words "Victoria Regina—Cudi Jussit" should be introduced; indeed, there is preserved in our Records a letter from Earl de Grey saying that Her Majesty in giving the Medal had desired to confer benefit upon the profession of British Architects in the manner thought best by those who were the most interested and the best informed respecting such a matter.

The career of M. de Vogüé has been of a character so in accordance with the modern idea of what a great archæologist ought to be, that I should fail in my duty were I not to trace, as rapidly as possible, the salient events of a life which may be advantageously studied by all men ambitious to explore, for the common good of the world, ancient countries once renowned but now slightly peopled and little known. M. de Vogüé's first efforts in this direction were made while he was attached to the French Embassy at St. Petersburg, from 1849 to 1851, when he published some

essays on the Ancient Art of Russia; and it was during the eventful period which preceded the establishment of the Second Empire that he commenced his study of ancient and mediæval buildings, particularly of those in Eastern Europe, Western Asia and the neighbouring African shores. In 1853-54 he visited Greece, Syria and Egypt, and the result of this tour may be seen in his well-known work on the Churches of the Holy Land, as well as other minor works. At the close of 1861, M. de Vogüé started to join M. Waddington, his great friend, and now one of the most distinguished ministers in the French Cabinet, who had, six months before, explored parts of Central Syria and made many important discoveries. Together, during the whole of the year 1862, these travellers visited all the country now designated Central Syria, and soon after their return M. de Vogüé published his book on the Temple of Jerusalem, and commenced the publication, in parts, of that extraordinary and valuable contribution to Archæological Science, entitled "La Syrie Centrale," being a series of accurate architectural drawings of numerous cities dotting a vast plain, and presenting a chain of monuments illustrative of early Christian construction between the fourth and seventh centuries of our era. In that exploration M. Waddington—who, though a French minister, has carried away honours from our Universities, and is the son of an Englishman—devoted himself to the study and collection of Inscriptions, and M. de Vogüé to drawing and architectural research. Sketches for the plates illustrating "La Syrie Centrale" were prepared by the Marquis, assisted by M. E. Duthoit, an architect of distinction; and when circumstances permitted, these illustrations were completed on the spot. This was particularly the case for the drawings of Jerusalem, and for many of those of Djebel Semán. Every detail was measured and figured with the utmost minuteness, and photography was sometimes employed to aid the explorers.

But apart from M. de Vogüé's literary and artistic fame he is familiar to English architects as the bearer of a name associated with the Hôtel de Vogüé, a mansion that most of us know and some of us have seen—a masterpiece of the Renaissance, situated at Dijon, and not the least instructive of those historical monuments for the conservation of which the French have passed statutory enactments enforced to the advantage of all architectural tradition, and to the special honour of their country. That celebrated residence, inhabited by the father of the Marquis of whom I am speaking, probably fostered a taste for the arts which, hereditarily transmitted, led the young Melchior de Vogüé to seek occupation for his leisure in lands where the earlier records of history lay, like an open book, to be read by anyone who could decipher and understand. The character of these archæological researches was not ignored by the French Government. In 1871 M. de Vogüé was nominated Ambassador at Constantinople, where he remained until 1875, and where, while devoting himself to official duty, he could still continue his early study of Oriental Art—study that a few years before had obtained for him the envied distinction of membership of the Academy of "Inscriptions and Belles-Lettres."

It now only remains for me to invest the Marquis de Vogüé, through his representative the Comte de Florian, with the Royal Medal, and in begging him to approach the Chair I have but a few remarks of personal address to make.

Sir,—I know that I speak the sentiments of the Institute of British Architects when I say that the offer of this Medal to you is a sincere attempt to signalise the gratitude which we all feel for the assistance you have rendered us individually and collectively by the publication of the books now lying on this table, and which adorn our library. In former years, a similar token of respect was paid from this Chair to Sir Henry Layard, Herr Lepsius, Mr. Fergusson, men not unknown to you; and I may add that while justly proud of a brilliant roll of Gold Medallists, we dare to assert that not the least distinguished among them are your compatriots—our colleagues—MM. Hittorf, Texier,

Duc, Lesueur and Viollet-le-Duc, the three first named of whom are unhappily dead; while among our own countrymen are numbered the names of Cockerell, Barry, Smirke, Pennethorne and Wyatt. We have invited you, Sir, to add lustre to the roll. I present you with the Royal Gold Medal, the gift of the Queen on the recommendation of this Institute; and in so doing I am glad to remember that it is given to an Honorary Member of our own body, an indefatigable traveller and archæologist, whose literary and scientific successes have been long recognised by the University of Oxford as well as by the Institute of France.

Professor DONALDSON, *Past President.*—Mr. President,—It may be presumptuous in me to add words to the excellent notice of the Marquis de Vogüé, which you have just read. We must appreciate the investigation, which has been able to lay before our members the various titles he has to our respect and admiration. He is not only a real archæologist, but an archæologist who thoroughly understands our art, and also the peculiar effects which the architect may be able to produce upon buildings of modern times. We admire him and his illustrious companion, M. Waddington, for the zeal with which they undertook these travels, in a country offering but few attractions for the politician; in a deserted and barren region—rude stones and rocks of basalt all around—no foliage, no trees,—but what did he find? Architecture of the most interesting kind. The builders had not had wood to serve their purpose in the erection of their edifices, but they had hard stone, which they brought into operation in a remarkable way. Their construction was necessarily and exclusively of that material; the floors were constructed of long beams, much in the style of Egyptian architecture; the staircases, the doors, with their hinges even, were of stone. All the details of that almost impracticable architecture he has brought under the notice of the learned world. This was the more remarkable, because we were not aware at that time of the existence of those buildings, and that they exhibited architecture of a simple and imposing character. It was a tradition of the Romans of the best kind—not of the period of the Antonines—but much purer, and carried out with great elegance and refinement. In the neighbourhood of Aleppo and Antioch were found similar remains of buildings, which show what was constructed by early Christians in their churches, basilicas and convents, exhibiting great refinement and constructive skill. Allusion has been made, Sir, in your Address to the illustrations which accompany M. de Vogüé's published works. They are not only beautifully drawn, but engraved with a precision and taste to be envied in this country. It is a remarkable circumstance that gentlemen in M. de Vogüé's and M. Waddington's position should go out seeking new and original illustrations of architecture from pure love of art; and undertaking these explorations through a country most difficult of access, in order to illustrate the architecture of a class of which we were hitherto ignorant. In the ruins of Baalbec and Palmyra we see the architecture of the decline of the Romans, exhibiting great sumptuousness, it is true, but never pure taste. But a striking feature is the refinement of the general distribution and details of these buildings of Central Syria, opening out a new sphere, a new world of art; and I could wish the younger members of our profession to study the volumes of M. de Vogüé, where they will find much to admire and much to imitate—not a servile imitation, but inspiration of something new—a fresh field for the exercise of talent; buildings with a new sentiment, and producing varied emotions upon the mind. We must, I think, feel some degree of pride that the companion of M. de Vogüé in these researches, M. Waddington, is half English; that we may lay some claim to so distinguished a traveller. We do not envy the French, but we are glad they possess such a one to participate in the liberal ideas and large notions of a great people. Perhaps it is presumptuous in me to say that I had the honour of proposing, when I was Secretary to this Institute, on the

occasion when it was proposed, that the Queen should be asked to bestow a gold medal upon our body. The presumptuous idea of a nascent society—to go to the Queen and ask for a medal! But we did it upon this ground: we felt assured, that if it were adopted it would be upon the principle that it should not be a medal for England only, but a medal for all nations—to join us together, to show our brotherhood in art, and co-operation in bestowing its honours with the gracious approval of Her Majesty, evincing our respect for those of other countries who cultivate the same pursuit, and our desire to associate them with us in all its branches. This was adopted as a grand rule, and it has been rigidly carried out. Every third year we have done ourselves the honour of associating with us a foreigner in the bestowal of this medal. I congratulate the Institute on this occasion for having conferred it upon the Marquis de Vogüé, because he has not only done credit to his country—he has conferred great benefit on our art.

Charles Barry, F.S.A., *Past President*,—After the eloquent remarks you have just heard from our friend Professor Donaldson, it would seem unbecoming in me to detain you even for a few moments, but inasmuch as it fell to my duty, being then your President, to be the medium of communication with the Marquis of the desire we had to honour him for the noble works he has achieved and the honourable name he has obtained, it seems only right for me to take some notice on this occasion when his representative attends here; and again to express my great pleasure in the fact of the award having been so made. I think it may add possibly to the appreciation with which M. de Vogüé will receive it, to know that famous, renowned and worthy as he is to receive it, his was not the only name which occurred to the Council in recommending the award to the general body of members and to Her Majesty. He has, therefore, the credit of not standing alone in his merits, but being paramount on this occasion. I greatly regret he is not able to be present to-night, and also the cause of his absence. I think M. de Vogüé will probably value this medal somewhat more than even he would otherwise have done, knowing that his name was proposed by a gentleman whom I may call his friendly rival in loving archæological strife, a strife which, leaving no personal bitterness behind, leads to the gradual development of knowledge. One other circumstance it seems to me desirable to mention; it is perhaps known to many of you, but it may not be inappropriate to the occasion to place it on record now. It is that all these valuable archæological labours, which the President has so well described, have been carried out by M. de Vogüé, not only at great personal sacrifice, hardship and very great expense, but they have been carried out by him entirely at his own cost. No kind of pecuniary aid has been given to him by Government or others. He has devoted his time and money—indeed a good deal of his life—to the pursuit of the study he has so much at heart, and for this we all now tender him our respectful and grateful thanks. That the roll of Royal Gold Medallists has been highly honoured by the addition made to it to-night is, I am quite sure, the feeling of every one present.

The Count Xavier de Florian, Secretary of the French Embassy in London.—Mr. President and Gentlemen,—I am sure M. le Marquis de Vogüé, who is prevented by an imperious family circumstance from attending this meeting, will deeply feel the honour which Her Gracious Majesty has been pleased to bestow on him through the hands of the President. He will also regret that he is unable to return thanks for this reward—the proudest object that a scientific and learned man could aim at. In speaking for him, Gentlemen, as he has courteously asked me to do, I experience the difficulty of a task before which I would shrink most assuredly, did it not give me an opportunity of alluding publicly to the Royal Prince, whose name remains connected both with the best days of your Queen's family happiness and the great artistic movement which has brought the name of your nation foremost in the pacific struggle for human grandeur and progress. I am

glad also to return thanks on behalf of M. de Vogüé to Mr. James Fergusson and Professor Donaldson, who were the earliest movers before your Institute that the recipient of the Royal Gold Medal for this year should be our late Ambassador at Vienna. I have also similar tribute to pay to Mr. Charles Barry, who, as your President, had necessarily a large share in the award. It is no slight satisfaction to me, Gentlemen, to hear your President remind us that M. Waddington,* before taking, hand in hand with your statesmen, an important part in maintaining the peace of the world, had shared the studies and labours of your new Gold Medallist. Such labours and such studies are not an unworthy preparation for tasks incumbent on a minister and a diplomatist. In seeking the secret of past civilizations, among the ruins of Syria, they must have listened to the lessons of history, and learnt from her imperishable voice that nothing is lasting in this world save what is good. Let me, Gentlemen, in concluding, add that this honour is not only one for M. de Vogüé, but also for my country; and I join his name with that of all those Frenchmen, whose hearts and minds are full with the care of noble studies, in thanking Her Gracious Majesty and the Institute of British Architects for this much-envied distinction.

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* The following extracts are translated from a Communication made by M. de Vogüé to the Academy of "Inscriptions et Belles-Lettres" (Institute of France):—

M. Waddington preceded me in Syria. After landing at Beyrout in April, 1861, he, during the summer, completely explored the Hauran, and in the autumn visited successively Palmyra and all the regions lying between Damascus and Aleppo. During this first round of visits a great number of localities, hitherto little or not at all known, have been described; hundreds of unpublished or badly-copied inscriptions have been noticed, monuments new in the history of art have been pointed out. Let me cite, for instance, the exploration of the eastern and southern declivity of the Djebel-Hauran, continued as far as the ruins of Omm-el-Gemal, situated in the middle of the desert to the south of Bostra, which, as far as I know, no European has ever described; also that of the Ledjah and the mountains situated between Antioch and Aleppo, the Christian ruins, of which M. Waddington was the first to perceive the importance; and, finally, the complete collection of the inscriptions of Palmyra, for which I have, during nine years, in vain asked the numerous tourists attracted every year by the ruins of Tadmor.

M. Waddington was just completing these different excursions when I arrived in Syria at the end of December, 1861. He came to join me at Beyrout, and we went together to Cyprus, in 1862, to pass the winter there. I abstain from enlarging on this portion of our voyage, the general results of which have already been communicated to you; let me remind you only that it produced, besides the complete exploration of the island, a collection consisting of eleven Cypriote, eight Phœnician (three of which are historical) and about a hundred Greek inscriptions. I have, moreover, taken note of all the monuments of the time of the Lusignans, monuments as French as the dynasty which erected them; the excavations made for M. Renan have also brought to light a series of sculptural fragments, now in the Louvre, belonging to all periods. By the aid of these unfortunately much mutilated fragments the student is enabled to trace every development of art in those regions, ever since the period when, taking its inspiration from the style of the Assyrians or Egyptians, who, each in their turn, were masters of the island, it produced works which, although they bore the impression of these powerful influences, are not devoid of some originality; thence, through the splendid period of the Hellenic ages to the epoch of succumbing to Roman uniformity, without, however, entirely traducing its Asiatic origin.

Leaving Cyprus we again returned to Syria, and, especially, visited Damascus, with a view to exploring Safa. M. Waddington had been unable to penetrate so far during the preceding year, but he had made due preparations for the spring and initiated relations with the Druse and Arab Sheiks, whose territories it was necessary to traverse. Thence we proposed to re-enter the Hauran, in order to complete, from a monumental point of view, the researches made the preceding year with regard to epigraphy and geography.

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The Holy City came within the scope of our researches. We stayed there during three consecutive months, which were almost exclusively dedicated to the Haram-es-Sherîf. We prepared the material for a complete monography of the celebrated inclosure, and, after a conscientious study of the subject, we adopted the conclusions above set forth. The rest of my time was given to the topography of the ancient city; I made a general survey of the soil, and, availing myself of some excavations, ascertained several important points which will enable me to base upon solid data the line of the walls and the identification of the principal localities. Thus I caused a fragment of the

wall, east of the Holy Sepulchre, to be cleared from the rubbish surrounding it, and I consider this fragment to belong to the second inclosure at the entrance of the Basilica of Constantine.

During our entire stay at Jerusalem, we did not leave the city more than twice; once to go to Hebron and Bethlehem, and once to visit the desert beyond Jordan, in order to inspect Araq-el-Emir, a most interesting ruin, inasmuch as it corresponds exactly with the description given by Josephus of a monument erected by a certain Hyrcanus at the beginning of the second century, B.C. This is therefore a monument the date of which is certain, approaching in style to the tombs of Jerusalem, and which, consequently, is of great importance for the general classification of monuments. It was of great use to us in establishing a fixed mark in studying the architectural *ensemble* of the principal features of which I have given a rapid sketch.

The epigraphical *ensemble* is not less interesting than the monumental and, like the latter, it has its unity; in fact, the Greek inscriptions of the Hauran furnish us with the complete history of the country ever since it had a history, that is to say, since the reign of King Agrippa. The first text shows us the new sovereign reproaching the inhabitants with their savage life, comparing their existence and their dwellings to those of wild beasts, and calling them, for the first time, to civilization; a few years afterwards these very people build temples, erect statues and engrave inscriptions in honour of their benefactor. After this comes the Roman empire, represented by several hundred texts, containing precious details respecting the organization of the provinces, the military forces, the Arab tribes. With the fourth century commences the series of Christian inscriptions which bring us to the eighth century, adding, to the former, details respecting the mountains of the North, and giving us the names of bishops, information respecting the ecclesiastical hierarchy, the *culte* of the Saints, and chronology. Among the latter series are placed several inscriptions relating to the Gassanid Kings, whose names appear for the first time in any Greek text.

I speak only cursorily of the collection obtained on the rocks of Safa, and cannot, as yet, say anything about them, except that the alphabet seems to have some analogy with the hymiarite inscriptions of Arabia. We have five hundred texts waiting yet for an interpreter.

The Semitic collection consists of five hundred Palmyrenian texts, more interesting to philologists than historians; one of them relates to Zenobia and two to Odenath; the rest deal only with the details of the interior life of the city. Then we have some twenty Aramian texts, gathered in the Hauran, most of them relating to honours or funerals; two Jewish inscriptions found in Jerusalem, one on the tomb said to be that of St. James, the other on a tomb on the route to Ramallah, and by which our opinion respecting the age of those monuments is confirmed; another is an inscription of a word found at Araq-el-Emir. All these texts throw a vivid light on Semitic palæography.

Finally, M. Waddington has made a complete collection of Arabic inscriptions from the towns of Damascus, Aleppo, Hamah, Jerusalem, &c., the number of which is upwards of fifteen hundred. Some of them are most important, such as the original inscription of the foundation of Kubbet-es-Sakrah at Jerusalem, in the year of the Hegira 72, and a Cufic inscription anterior to the Hegira by some years.

APPENDIX.

SUPPLEMENT TO MR. FERGUSSON'S PAPER ON THE ERECHTHEUM AND TEMPLE OF MINERVA POLIAS AT ATHENS.

On the 14th of February, 1876, I had the honour of submitting for the consideration of the members of the Institute, a Paper embodying my views of the disposition and internal arrangements of the Erechtheum at Athens, which was afterwards printed among Sessional Papers for that year.

As soon as I obtained my "short copies" of the Paper, I forwarded one to Professor Michaelis of Strasburg, who—as mentioned in a note to my Paper—had simultaneously with myself, but without any concert, arrived at the conclusion that the Olive tree was not inside the building we now see, but stood in the open air, in a court-yard to the westward of it. A fact that, then as now, appeared to me the key which unlocked the mystery of the whole building. On the 8th of April, Professor Michaelis replied, adhering in spite of all I urged, to his original opinion, that the eastern division of the Temple, was that of Minerva Polias, and the western the Erechtheum properly so called. At the same time pointing out what he considered more important than this, that my restoration was vitiated by my having overlooked the existence of six loopholes in the masonry, which he maintained were original parts of the structure. In answer to this I stated, that I was aware from a photograph of the existence of one at least of these loopholes, but that on applying to Mr. Penrose he had assured me that they were loopholes pierced for musketry by the Greeks or Turks, when the place had been turned into a fortalice, as we unfortunately know too well it had been, when the possession of the Acropolis had been disputed between these two parties. On the 6th of December of the same year, I received a short letter from him still maintaining his ground, but stating that he had embodied his views in a Paper he had sent with the requisite drawings and diagrams, to be published in the "Mittheilungen des Deutschen Archäologischen Institutes in Athen." This was printed and reached me in due course, but at that time my mind was so fully occupied with the preparation of my work on the "Temples of the Jews," that it was not till April in last year that I was able to take up the subject and reply to his pamphlet. On the 18th of that month in last year, I wrote him a very long letter, in which I pointed out why his restoration appeared to me untenable. In the first place, because I could not conceive so artistic a people as the Greeks filling the interior of one of their most beautiful temples with wooden floors and wooden staircases unsymmetrically arranged, and altogether with less dignity and grace than are to be found in nine-tenths of the second class dwelling-houses in London, and other modern towns. In the second place I pointed out that the loopholes, as he used them, did not and could not serve the purposes for which they were intended. In some instances they were useless, and in all insufficient, if intended to light the interior of the apartments in which he placed them. In the third place I insisted that the route he described Pausanias as taking, in his perambulation of the Temple, was not only so improbable as to be almost impossible, but was besides contradicted by the words of his text, so as to be utterly inadmissible. There were besides minor objections to details with which I need not now trouble the Institute.

Though this letter was written, and received by him nearly two years ago, its receipt has not yet been acknowledged, and in answer to an enquiry made through Mr. A. S. Murray of the British Museum, he replied that he had not done so, because it would take a volume to reply to my letter; and ill-

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* See Sessional Papers, 1875-76, pp. 139 to 158, with Supplement, pp. 1 to 10.

health and other pressing engagements have hitherto prevented his taking up the subject. As my impression is, it will take two or three volumes, instead of one, to establish his theory and demolish mine, I cannot afford to wait any longer for their appearance, and am anxious for an opportunity of stating what I conceive to be the bearing these loopholes have on my restoration; how far their existence supports or refutes the views I ventured to express in 1876, and to do this in the same publication that contains my original essay.

The simplest and most obvious mode of effecting this would apparently be to publish the correspondence as it stands, thus giving the views of both parties with the utmost fairness. My letters however, are as much occupied with the refutation of the Professor's views, as with the establishment of my own, and consequently lead into a variety of details which would be unintelligible without translating the text of his pamphlet nearly *in extenso*, and without reproducing his drawings and diagrams. I am unwilling to ask space for this; for his restoration appears to me so complete a *reductio ad absurdum* that, as far as I can judge, his arguments refute themselves. On the other hand the introduction of loopholes, as an original feature in Greek architecture, is so novel and their application to the lighting of this particular Temple so important for a knowledge of its internal economy, that I feel no apology is necessary for bringing the subject before the members of the Institute. I shall try and do so as briefly as is consistent with clearness, avoiding all subsidiary subjects, reserving these for future discussion, should Professor Michaelis or any of his friends think it expedient to bring his views under the notice of the Institute. Should this be done, I hope the discussion will mainly be confined to the establishment of his hypothesis, for nothing is so unprofitable in such cases, as mere destructive criticism; nothing in fact is easier than to show that Forchhammer,* Böckh,† Michaelis,‡ and others are wrong. They are schemes proposed by scholars who were not architects; but proving their theories to be wrong, merely amounts to the removal of three or four adversaries among a dozen or a hundred, who are at present or may become adversaries, without by this process advancing the truth one iota. The only true and useful criticism is to do better, and then their proposals fall *ipso facto* to the ground. In the following remarks I have confined myself wholly to an attempt to explain all the indications, written or structural, that I can find tending to elucidate the arrangements of the buildings. So soon as anyone can do better, I withdraw from the contest, but not till then.

It is not the least curious circumstance connected with these loopholes, that no one should have observed them before 1873. Stuart and all those who followed between his time and that date, though they could not help seeing them, must have come to the same conclusion as Mr. Penrose, that they were cut as musketry embrasures. Even Tetaz and Beulé, though they examined the place with such care, do not mention them,—though the first-named marks two of them in his elevations of the interior. On Tetaz's plate 158, figure iv., page 141 of my former Paper, one will be observed at the height of 3·30 mètres above the floor-line, and 2·30 mètres from the east jamb of the northern door. The corresponding one on the south side, though blocked up with brickwork, is still to be seen in a nearly similar position, in a sinking in the inner face of the south wall. The real discoverer of them was consequently Carl Boetticher. He marked them in his plan of the Erechtheum in the Atlas to his "Tektonik der Hellenen," (1873), but without description; and he described them, but without drawings, in his "Untersuchungen auf der Akropolis von Athens," published in the same year. From the text and plates being in different works, they were easily overlooked, and I did not become aware of their importance till my attention was drawn to them by Professor Michaelis, who had personally

* Daduchos. Kiel, 1875

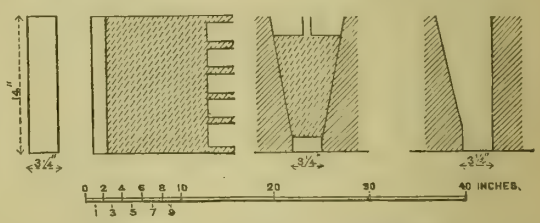
† Adopted by Mr. Newton of the British Museum in his Ancient Greek inscriptions, 1874, plates i to iii. p. 85.

‡ Mittheilungen des Deutschen Archäologischen Institutes in Athen, 1877, pp. 15 to 37.

examined them, and convinced himself that they were really essential features in the original design of the Temple, a fact which it does not seem possible to doubt in the present state of the evidence. They are cut smooth and polished at the inner edges, and are pierced in the centre of the blocks of stone, not in the joints between the stones, as would almost certainly be the case had they been intended for musketry or any other purpose in modern times.

The loopholes in question are six in number, two in the walls of the eastern Temple, apparently exactly opposite to one another, and four in the western division of the Temple, on the same level as those in the other, but not all apparently exactly facing each other. On the inner wall of the western Temple, it will be observed there is a sinking something less than one mètre in height at 2·90 mètres above the floor line (see Tetaz's plate 158, in the former Paper, 1875-76). It is in this belt, or the corresponding courses on both sides, that all the loopholes are situated. The roof or fittings which belonged to the arrangements in the western Temple—as will presently be explained—were probably in wood, and the sinking consequently remains unbroken. In the eastern Temple, the flooring slabs were certainly in stone, dovetailed into the wall, and have been torn from their counter-sinkings. Hence the ruined condition of the wall, which does not consequently show the panel, but necessitated its having been repaired by modern brickwork. Throughout, however, this sinking or panel corresponds with the first great basement course of the exterior on the south side, in the centre of the great stones of which the loopholes on that side are cut, and at the same level in the smaller courses on the north side.

The dimensions of all the loopholes are 14 inches high by $3\frac{1}{4}$ wide externally. In the interior five of them expand laterally to 17 inches. One —that under the northern portico—is only 12 inches wide,* having one jamb perpendicular to the wall, in order to free the woodwork, which as we shall presently see, almost certainly existed there. The other jamb sloped to the interior at the same angle as those of the other five.



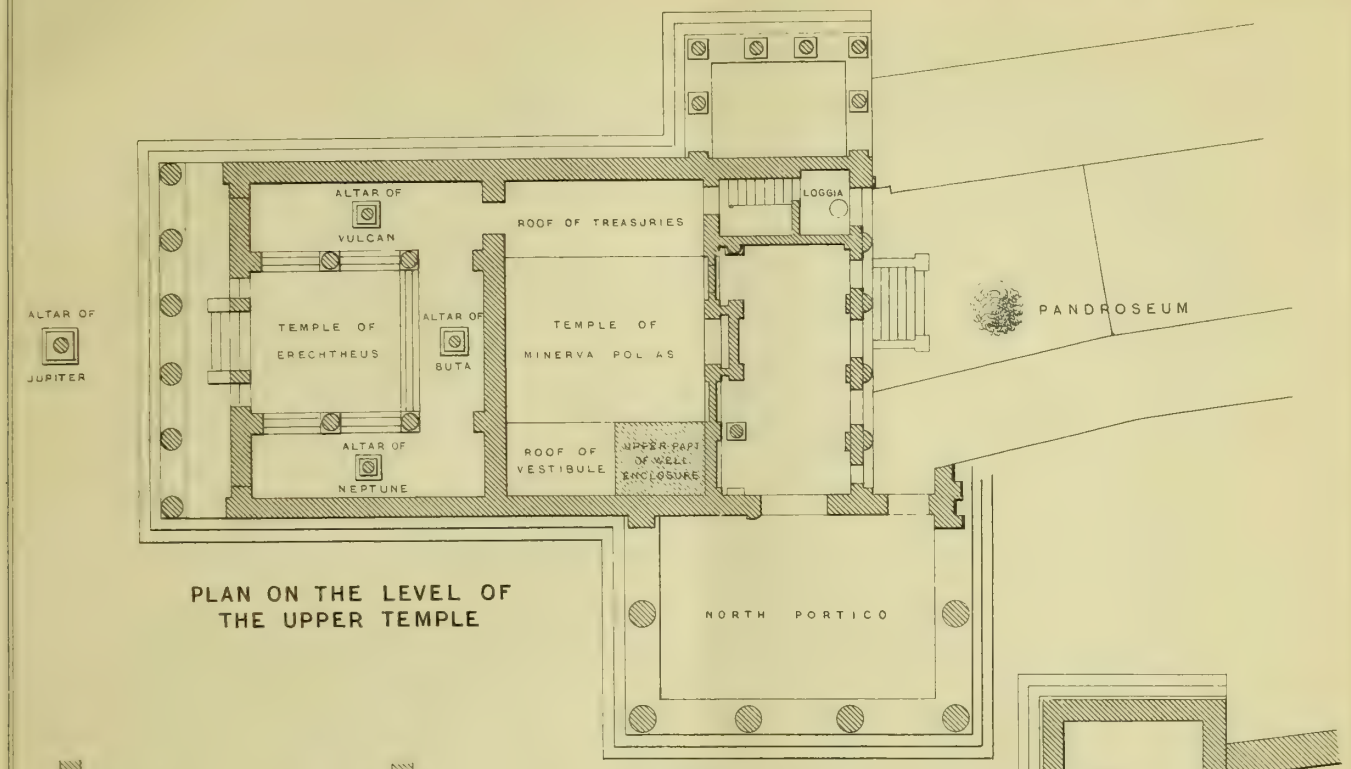
Loopholes in Erechtheum from Michaelis.

Assuming therefore, as a fact that does not admit of dispute, that these loopholes are integral parts of the original design of the Temple, it now only remains to point out, what bearing they have on the restoration I proposed in my Paper of February, 1876. Their position is shown in the plan on the level of the lower Temple, in the annexed illustration, where for clearness of description they are distinguished by the first six letters of the alphabet.

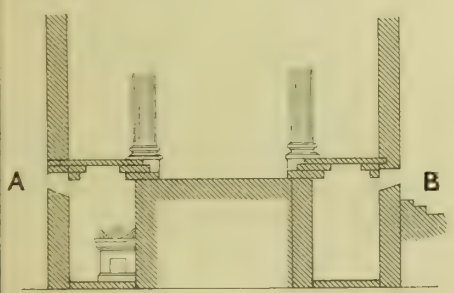
Taking those of the eastern Temple first, it will be remarked that under the northern aisle I had placed a chamber measuring between 6 and 7 feet in width, and about 16 feet in length. Minute accuracy was impossible, in consequence of the mode in which the remains had been excavated and removed; a few inches more or less however in this instance is of no importance. Being a sepulchral chamber, I assumed that it had been lighted by a lamp, or some sort of artificial light only, but had I dared to suggest the introduction of daylight, it would have been by a window of exactly the dimensions and in the position of the loophole A. It is just such as a modern architect would employ for the purpose of introducing light and air into a sepulchral apartment, but who would have dared to suggest such a thing in a Greek temple? Its presence however, now it is found, is a proof—if any was needed—that I was right in placing the Tomb of Erechtheus where it is shown in my plan.

† Boetticher, Untersuchungen, p. 199. The inches I presume are Rheinland not English inches, but the difference in this case is infinitesimally small.

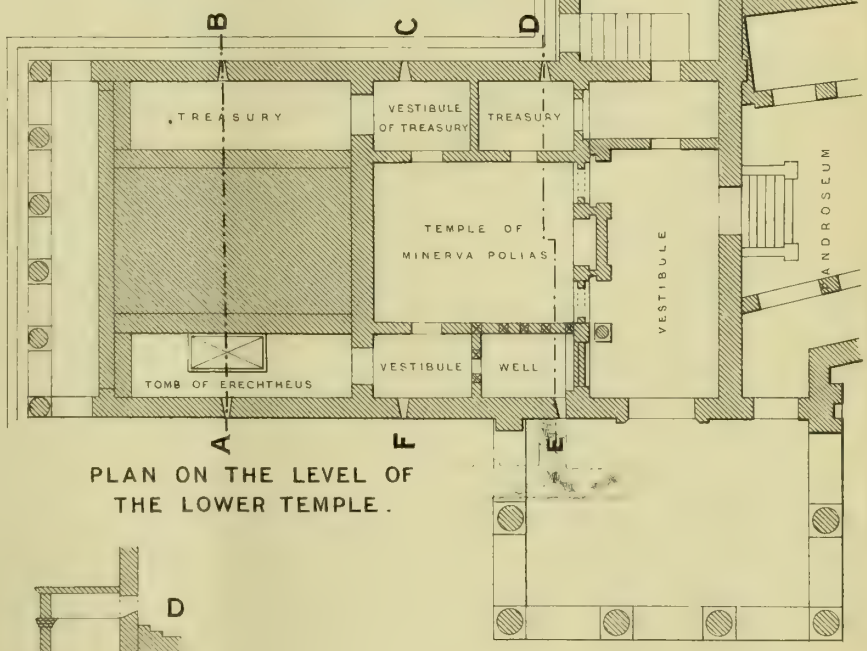
Appendix



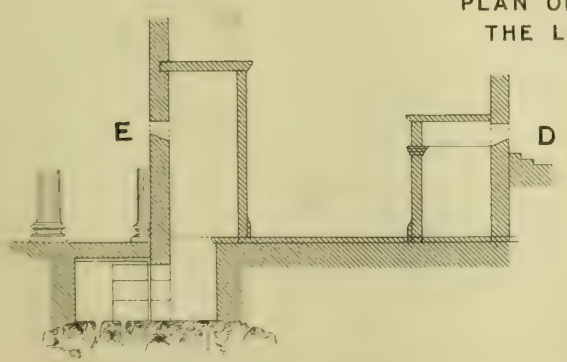
PLAN ON THE LEVEL OF
THE UPPER TEMPLE



SECTION ON A.B.



PLAN ON THE LEVEL OF
THE LOWER TEMPLE.



SECTION ON E.D.

PLANS & SECTIONS OF THE

ERECHTHEUM AT ATHENS.

AS RESTORED BY Mr JAS FERGUSSON.

Scale.

0 5 10 15 20 40 60 Feet

The inner surface of the wall below the floor of the eastern Temple, on the south side, is composed partly of marble blocks from which the knobs, used in the construction, had not been smoothed off, and partly of blocks of Pirræan stone rough-hewn; I therefore came to the conclusion that there had been no chamber on this side, otherwise it appeared to me that the wall would have been of polished blocks of marble, like that on the north side, though I certainly was surprised the architects had thought it necessary to carry down the wall to the level of the floor of the western Temple, which appeared purposeless if it were to be filled up solid like the centre. The existence of the loophole B proves that I was mistaken in this. There certainly was an apartment here, but from the roughness of its interior it evidently was one to which the public had no access, and could only have been a treasury, like those which General Cesnola found, under-ground, attached to the temple at Curium in Cyprus.* For such a purpose it seems so admirably suited that it may fairly be assumed that this was its destination, and the mode of lighting is just what was suited for such a purpose.

Although nothing could be more satisfactory for my restoration than the position of these two loopholes in plan, their height vertically requires a slight modification in the plan of the upper Temple, which it is necessary to explain. I have unfortunately no section from which it can be ascertained at what height above the floor of the eastern portico the head of these loopholes is situated; but from the photograph, and the position of the sinking in the western Temple, it is clear that to provide the requisite head-room the floor of the aisles, in the eastern Temple, must be raised from 18 inches to 2 feet above the level at which I had placed it. It is not easy to see why they were placed at the level we find them at. Even having regard to external appearances, it seems they might have been placed in the great basement course, 6 or 9 inches lower. But it was not so, and all we need observe here is that a slab 3 or 6 inches thick, immediately over the loopholes, would suffice for the floor of the aisles as shown in the section A. B. (see Illustration).

There are various ways in which the additional height can be obtained without much difficulty. In my original restoration I had used four steps of 6 inches each, one in the doorway, and three leading from the floor of the Temple to the aisles, making 24 inches altogether. All the steps, however, leading to the eastern portico are each 10 inches, and there seems no reason why risers of the same dimension should not be used internally. This would give an additional height to the aisles of 16 inches, and this I fancy on a correct section being made would probably be found sufficient. If more is required, I would suggest that two or three steps be applied externally in the portico, though that would require the altar of Jupiter being placed outside instead of inside the portico,† to which there seems no objection, and these five or six steps so provided would more than suffice to get over the difficulty. Thus the four steps in my original plan rise only 24 inches; five steps at 10 inches would give 4 feet 2 inches, which is more than is wanted; and 6 steps, even at 9 inches, give 4 feet 6 inches which is likewise in excess of the requirements. The objection to two steps externally is that in Greek temples an unequal number is generally employed. But does not this apply to entering the portico, or peristyle of the Temple from the exterior, not to internal arrangements? On the whole, I am inclined to suggest two steps in the portico and three in the Temple of 9 inches each, which make up 3 feet 9 inches, which, in so far as the plans admit of accuracy, is the exact quantity required. The western doorway, and the wall on either side of it, have been so completely removed, to make room for the apse of the Byzantine church, that there is not the smallest indication on the spot to guide us in our choice of these various modes of adjusting the levels. In whatever manner it may be done, it

* Cyprus, its Ancient Cities, Tombs, and Temples. Murray, 1877, p. 304, et seq.

† The words of Pausanias are *πρὸ δε της εισόδου Διός εςὶ βωμὸς*, I. 26.

makes no difference in the plan of the eastern Temple as I originally proposed, only in the height of the floors and columns, or rather only in the height of the risers of the steps to be employed internally.

The existence of the two loopholes, C and D, reveals to us a state of things I was not prepared for, when I wrote in February, 1876, but affords a most valuable addition to our knowledge of the arrangements of the Temple, without in any way invalidating what I then proposed. With the counter sunk belt on the inside, in which they are placed, they prove as clearly as anything well can do, that the south aisle of the western Temple was enclosed by a screen, probably partly in stone partly in bronze, and with a wooden roof whose surface was between 12 feet 6 inches and 13 feet from the floor-line of the Temple, on the same level as the floor of the aisles, in the eastern division. From the different appearance of the inner wall, in the two divisions of the Temple, it is as evident that the roof of the aisle in the western one was of wood, as that the roof in the eastern division was of stone. It seems too to have been framed to a thickness of rather more than 3 feet, while as the roof may have been composed of planks not more than 2 inches in thickness, it is easy to understand why the loopholes in this division were placed between the trusses at such a height as we find them. It was probably for the sake of making them uniform externally, that those in the eastern division were placed 6 or 9 inches higher than now seems convenient.

Although no symmetry can be discovered between the spacing of these three loopholes externally, this is not quite the case with the latter two internally. They seem to be placed so symmetrically with reference to the east and west walls of the Temple, and at an equal distance from its centre, so as to suggest a division into two equal apartments. This I consequently have adopted, though without much authority for so doing beyond this. But, besides this, it seems probable that the eastern half would be used as a vestibule to the Treasury, and the western half might be that where the bedstead of Dedalus, the coat of mail of Masistius, the scimitar of Mardonius, and other treasures mentioned by Pausanias, were kept. We must also find a place for the Hermes and the myrtle he mentions. In fact, when we come to think of it, as all these objects could hardly be exposed in the Temple itself, *armoires* or presses must be provided in which they could be preserved in safety. These covered side aisles seem perfectly suited for such purposes, and in them any one may arrange these treasures as he thinks most suitable. The one point of importance that we learn from the existence of these loopholes is, that the whole southern side of the Temple on the level of the floor of the western part, was arranged as a treasury and ante-treasury, or apartments answering that purpose, in which the various objects of interest belonging to the Temple were kept and exhibited to the privileged few.

Loophole E, under the great portico on the north side, is probably the most interesting of the six, and helps more to clear up what before was mysterious, than any of the others. On looking at the elevation* of the inner face of the northern wall, it will be observed that at a height of 18 feet from the floor-line there are five mortice-holes, 10 inches square, and apparently only 2 or 3 inches deep. They extend 11 feet 6 inches east and west; but what they represented, when I first wrote, I was quite at a loss to divine. It now becomes clear, from the existence of the loophole E, that these sinkings received the ends of the rafters which formed the roof of a closet or enclosure, which would otherwise have been wholly dark. Its position also explains the exceptional form of the loophole; for if we draw a 10 inch (9 inch?) post under the most western of these sinkings, it cuts the loophole in such a manner as to obscure its western splay, had it been made like the others. If the same batten is continued to the floor-line, it stands exactly on the inner edge of the sinking,

* See Sessional Papers, 1875-76, p. 141, Tetaz's plate 158.

which I suppose to be the well of salt water mentioned by Pausanias, and all this fits so exactly that it is almost impossible the coincidence can be accidental. The plate attached to the report of the Athenian Commission, confirms all this so completely, that we attain an almost absolute certainty that this was the well mentioned by Pausanias, and that it was enclosed in a closet 11 feet 6 inches wide, by 17 feet 6 inches in height, and probably 7 feet in breadth. The object being, no doubt, to aid the juggle by which the uninitiated were made to believe they heard the sound of flowing water when the south wind blew. It would puzzle any modern artist to say how this curious enclosure could be rendered ornamental. But with marble, bronze and painting, a Greek artist could no doubt clothe in beauty much more ungainly objects than this. That, however, is not the question here. What at present it is important to determine is its existence, which seems no longer doubtful, or that the use of this enclosure was to cover and aid in the miracle of the well.

The existence of the loophole F, is only important as showing that there was an enclosed vestibule to the tomb-house of Erechtheus, which it served to light. There are, however, no indications on the wall to show how this vestibule was roofed; but as no access was obtainable to its upper side, it may have been very slight, and did not require any support from any sinkings in the wall. In plan its dimensions are easily fixed from its position between the covering over the well, and the wall dividing the two Temples, and it is this that makes me believe that there was a corresponding vestibule on the opposite side leading to the Treasury. Otherwise I would not have ventured to divide that apartment into two, as is shown in the plan of the lower Temple.

The consequence of all this is that the discovery of these loopholes, so far from upsetting my theories, as Professor Michaelis supposes, serves to confirm them in every particular, in so far as I understand the case. But more than this, their existence has enabled me to explain certain features and peculiarities in the western Temple, which before their discovery I was obliged to put aside as inexplicable mysteries. As the case now stands, it appears only to be necessary to make out detailed drawings on a sufficient scale to understand and appreciate all the internal features of this most beautiful but most complicated building—of its class perhaps the most elegant thing the Greeks ever executed.

From the above explanation of their position and use, it consequently will be seen that the discovery of these original loopholes, so far from presenting any difficulty, offers in reality a most satisfactory confirmation of the theory of restoration proposed in my original Paper. There is not now a single marking or indication on the walls of the interior of the double Temple, which is not accounted for, and when the details of this restoration are drawn out to a sufficient scale, all the arrangements of the *διπλοῦν οἴκημα* will become perfectly intelligible.* There, perhaps, a more prudent man would leave the question, but there are some markings at the southern end of the vestibule of the Temple of Minerva Polias, which are so interesting that it is a pity to leave them without, at least, an attempt to explain their significance. So far as is known this has not yet been attempted by anyone. Yet Tetaz's drawings, and those of the Athenian Commission, are so distinct, and so perfectly in accord with one another, and these are again so completely confirmed by photographs in my possession, that the facts of the case may be considered as perfectly ascertained. At the same time we must always bear in mind that we are examining a building as truthful in every respect as a work of nature, and regarding every detail of which we may reason with the same scientific precision as we could with regard to an animal or a plant; consequently it seems well worth while to

* The illustration accompanying this and those in my former Paper are—it need hardly be said—mere diagrams to explain the arrangements, without the smallest pretention to being architectural representations of the Temple.

utilise any information we may gain from a thorough investigation of its anatomy. Still the results of my examination are so unexpected, so unlike indeed to anything that anyone could look for, that I would willingly, as I have just said, leave them alone. They have no very direct bearing on the arrangements of the main building, and as they certainly will at first sight be received with incredulity, and being considered improbable, will throw a halo of doubt over what has been said, not only in this but in my previous Paper; still, being facts, they are interesting, and their indirect bearing on the arrangements of this most irregular building is so curious, that it is worth while risking the chance of a little obloquy in bringing them forward.

Anyone looking at Tetaz's Plate 158, p. 141, but more distinctly at the corresponding plate in the work of the Greek Commission (Πρακτικά), and still more so in the photographs, will perceive that the whole of the south end of the vestibule of the Temple of Minerva Polias, is left rough, except the half of the upper part shaded darker to represent a sinking in Section, fig. 1, Plate 158. What this means is, certainly, that no part of it was intended to be seen from the interior. The doorway, for instance, with its lintel, and the stones forming the jambs on either side, are all rough and unhewn, though the jambs and lintel on the outside are smooth-hewn, and the jambs adorned with pilasters,* though these could not be seen from the outside, but only by those almost touching it, at the bottom of the stairs inside the Caryatid porch. If they were so careful to adorn the outside which could hardly be seen, it stands to reason that they would be more careful with the inside which must have been visible to all, unless it were covered up from sight. That it was so covered consequently seems quite certain, but whether with a wainscoting of wood, or with plates of bronze, is not clear. But it may also be that the end of the vestibule was cut off by a screen ranging with the front of what I have called the Treasury. This latter, I confess, appears to me the more probable solution, but in that case we ought, perhaps, to find traces of this portion on the inner face of the western wall, where probably they do exist, though they have escaped observation, probably because no one has looked for them. At the same time, however, it must be observed, that the traces of two transverse screens or walls, which every one admits, dividing the Temple into three rooms, are so slight on the north and south walls, that their existence would not have been suspected, but that the difference of levels and other indications rendered their presence indispensable to a proper understanding of the building.

On the upper part, alluded to above as smooth-hewn, and measuring above 6 feet in width by more than twice that in height, Boetticher† was fortunate enough to find traces of the original paintings of the Temple. The marble, it seems, was overlaid by a thin coating of gesso or fine plaster, barely a line in thickness. On this the colour was laid, mixed with resin (query turpentine), and wax, the reds, greens and yellows retaining their freshness to the present day; but nowhere did a sufficient surface remain to enable the pattern to be made out. From its form and position, it is evident that this sinking formed one side of a chamber extending to about 7 feet in depth from the outer face of the western wall. On the inner or eastern side traces are still found on the southern wall of the partition that closed it on the eastern side. Some of the stones being placed on edge, and others showing the marks of a partition wall 9 inches in thickness. The north wall, as might be expected, is entirely gone, and the pier on which its western end must have originally abutted having recently fallen down, it cannot now be hoped that any traces of it will be recovered,

* Inwood, the Erechtheion, plate 14, three first figures on the left.

† Carl Boetticher, Untersuchungen zu Athen, &c., p. 205. He was enabled, with his penknife, to remove several square inches of this coloured plaster, and has deposited it in the Berlin Museum, where it may now be seen.

though from the position of its centre there is no difficulty in ascertaining where it originally must have been placed. The most curious fact, however, regarding this chamber or loggia is, that it was entirely open to the west, above a parapet wall rising 6 feet 6 inches above the plinth on which the three-quarter columns stand. This is so startling a fact, that it was long before I could convince myself of the reality, but the evidence seems irresistible. In the first place, looking at the two perspective views in Stuart's Athens (vol. II, ch. ii., pls. I. & II.,) it will be observed that the intermediate spaces in which the three windows are represented, are filled with masonry, but this one is void, with a straight edge on both sides up to the underside of the architrave of the order. This is still more clear in Dodwell's folio plates,* where the straight edge is even more plainly shown, and in such a manner that it is almost impossible that any masonry could be bonded with it. At the same time it is well known that Dodwell was a singularly accurate draughtsman, and all the other details of his drawing are confirmed by the existing remains. Inwood, having only given an elevation of the west front of the Temple in outline, and the architrave having fallen in 1827, does not so directly confirm this, but indirectly he does to the most satisfactory extent, inasmuch as all the other four intercolumniations are filled with masonry for their whole height, while this one is entirely void. Tetaz's drawings and those of the Athenian Commission being made after the screen had fallen do not afford any information on this point; but both represent the southern wall with a straight edge of such a form as to render it almost impossible that this space should have been closed by a wall of masonry above the 6 ft. 6 in. above alluded to, and the photographs confirm this to the fullest possible extent.

From all this it appears to me to be proved beyond doubt that there was originally, in this position, a niche or loggia about 7 feet square in plan, and open to the west from the under side of architrave of the order, to the summit of the parapet wall which marked its floor-line. Its roof-stone probably rested in the upper inner side of the architrave, and its internal height therefore probably was between 13 and 14 feet.

I am, of course, perfectly well aware that all restorers, from the time of Stuart to the present day, have neglected these indications, and restored this façade as perfectly symmetrical, but they have equally omitted to observe that the corresponding intercolumination at the north end of this façade was pierced by an opening 10 feet high by more than 2 feet in width, which was built up with rubble masonry in modern times. Both Dodwell's and Inwood's plates make it quite certain this was the case, though now that it has fallen it is extremely difficult to guess for what purpose it was introduced there; it must have been something connected with the entrance to the Pandroseum below, but that is not now the question. What interests us here is that whatever it was, it destroyed the symmetry of the façade to as great an extent as the loggia at the opposite end, and with the position of the doorway out of the centre, rendered this western front of the Temple as unsymmetrical as any façade applied to any æsthetic building in ancient or mediæval times.

The *instantia crucis* of this, or of any other part of the restoration of the Erechtheum, is that it shall accord with, and elucidate the inscription in the British Museum, so often alluded to in my previous Paper. Fortunately this discovery, if I may so call it, does so to the fullest possible extent. In line 75, a statue (ἄγαλμα) is mentioned, which no one has been able to account for. Böckh and K. O. Müller suppose it to be the ancient image of Minerva mentioned in the preamble, but without any authority for such a supposition.† It is now evident that the ἐντὸς of line 69 does not refer to the

* Views in Greece, folio. The plates are not numbered.

† Ancient Greek Inscriptions in Brit. Mus. (by Newton,) p. 93.

interior of the διπλοῦν οἴκημα—indeed nothing in the inscription does, but to the Court of the Pandroseum. The prostomaion (line 71,) is as Boetticher makes it (fig. 37) the entrance from the great northern portico into that court. The parastos (line 73,) some part of the western wall, and the wall near the statue (line 70,) is the part immediately under the niche just described. I assume, as a matter of course, that this loggia did contain a statue, for I cannot conceive any other purpose to which it could have been applied. The Greeks, so far as I know, never placed their statues in shallow semi-circular niches before the time of Alexander the Great, if even then, as the Romans afterwards universally did; and if they wished to expose a statue externally, it could only have been, I conceive, in an open loggia, like this one; while such an apartment 7 feet square, and with an external opening of 4 ft. 7 in., could hardly be appropriated for any other conceivable purpose.

But if this were so, whose statue was this likely to be? Not of Minerva certainly, as it is most improbable that her image would have been exhibited outside a temple, whose whole interior was arranged to enshrine her. Sometimes I have fancied it must be Cecrops, and that this apartment consequently bore the name of Cecropium. The latter is mentioned three times in the inscription (lines 58, 63, 83,) and always is in close proximity to the Caryatid portico. So far there is nothing to contradict the idea, but it seems hardly sufficiently important for that, and I am still inclined to believe that the tomb that bore the name of Cecrops was in front of, and to the southward of the Caryatid portico. If the statue were that of the nymph Pandrosos, it would get us over a great difficulty. Michaelis fancies her shrine was a small cell or templet just under this niche, and the reasons he gives for placing it there would equally apply to this loggia, and looking on to and being seen only from the court-yard, known certainly as the Pandroseum, it would answer all the purposes of such a statue, which was not that of a god to be worshipped, only of a nymph to be honoured and remembered.

Assuming, therefore, which I think we may safely do, that there really was a niche or loggia here containing a statue, when we turn again to the interior we find several problems which it is not very easy to settle. There would be no difficulty in finding a slab of marble 7 ft. or 7 ft. 6 in. square to form the floor of the niche. There is a block 14 feet long immediately below it, and it would be easy to support it on the south and west sides; but the north-east corner would require extra support of some sort. The most obvious expedient would be a pillar under the angle, and there is in the Fitzwilliam Museum at Cambridge a shaft of green marble brought home by Dr. Clarke from this Temple, which would suit very well for this purpose. There are doubts, however, whether it did not belong to the Byzantine Church, and there are no mouldings upon it to prove to what age it should be ascribed. A more important objection is, that it would stand exactly in the centre, and in front of the present doorway, which seems a very improbable arrangement. I fancy, therefore, that there must have been a screen-wall with a central opening, 6 or 7 feet in front of the present south wall, and which bore a stone beam sufficient to support the floor-slab, and the superincumbent partition-wall. I am the more inclined to this, because the return, from this new opening to the west wall, would be exactly equal to that from it to the door in the western wall, and may thus account, to a certain extent at least, for the position of that doorway out of the centre of the façade. The great point, however, is that this second screen would account for the unfinished state of the lower part of the south wall. It would then form practically an extension of what I have called the Treasuries, and would not be accessible to the public. In fact, I do not believe the entrance through the Caryatid porch was ever used, or indeed almost known, except to the priests and servants of the Temple.

There is one other small question regarding which it may be well to say a few words before

leaving it. It is to ascertain whether or not the priests had access to this loggia from the interior. My impression is they had ; at all events, it is easy to see how it could be managed if they wished it. Turning to the section on Tetaz's plate 158 (see my previous Paper), it would be seen, as now restored, that the floor of the aisles of the upper Temple is exactly on the level of the roof of the Treasuries of the lower Temple on the southern side, and consequently if a door were pierced at that level in the wall separating the two, a communication between them would be easily effected. Then if a line is drawn from the west end of the sinking shown in the drawings, to the east end of the floor of the niche, it will be exactly at an angle of 45 degrees, and there are several indications along this line to show that something was fastened in the wall along its course. Altogether, it seems more than probable that a stair did exist here, not in stone, of course, but in bronze or wood, giving a private means of access to the servants of the Temple to all the different parts of it. Whether they had any means of descending from the roof of the Treasuries to the floor of the Lower Temple, is by no means clear. We could easily manage this by circular steps in bronze—whether the Greeks were ever sufficiently clever, mechanically, is another question.

Whether these means of internal communication existed or not, it is quite evident that if they did, they were used by the servants of the Temple only. The public, like Pausanias, after visiting the upper eastern Temple first, which they naturally did, were forced to go out again by the doorway by which they entered, and then to pass down the steps on the north side, and enter the Temple of Minerva Polias by the great doorway under the northern portico. The usual mode of peregrination probably was to go out again by the same great doorway, and enter the Pandroseum by the prostomaion under its western prolongation ; but anyone may also have taken a shorter cut, and entered by the doorway leading from the vestibule in its centre. This at least is certainly the route followed by the celebrated dog whose movements have had so much influence on the historical topography of the Temple.

Nothing has occurred, since the publication of my first Paper on the subject, that throws any additional light on the disposition of the buildings of the Pandroseum, to the westward of the great Temple. Nothing indeed is likely to be discovered except by an exhaustive and a systematic excavation of the whole area, and it is even then more than doubtful if any results will be obtained sufficient to repay the labour and expense of such an investigation. If it is true that the area was used as a burial ground during the Byzantine times, it is more than probable that all ancient foundations were removed or disturbed by the graves to such an extent as to be unrecognisable at the present day. Even if it was not a graveyard, it is certain that at the beginning of this century it was covered by houses built to accommodate the Turkish garrison of the Acropolis, and their foundations and cellars may equally have served to obliterate all traces of such remains as were not utilised in their erection. Until some new facts are obtained by excavation or otherwise, all speculations regarding the building of the Pandroseum can be little more than contests of ingenuity between modern antiquaries, and as such of comparatively little interest to the general public. It may be that the cella of Pandrosus was merely a little shrine situated close to the western wall of the great Temple, as it is represented by Professor Michaelis, or it may be as I have represented it, a somewhat more important edifice occupying the western side of the courtyard in which the olive tree was planted, and that there were certain apartments attached to it, and a stoa on the south side of this court. All these, however, are merely suggestions derived from the text, and the form of the localities, and liable, like all such, to reversal on an appeal to the spade. What we do know is sufficient to enable us to speak with confidence regarding the appropriation and general disposition of the building. For that purpose it is sufficient for us to know—

which we may now say we do with certainty—that the Olive tree stood in a courtyard, bounded on the east by the wall of the Temple of Minerva Polias. On the north we know certainly from Boetticher's researches* that it was bounded by a wall running at an angle of 14 degrees † to line of the axis of the great Temple; on the south by a terrace wall of rough masonry still existing, but which I believe was hidden by the stoa mentioned in the inscription. How it was enclosed on the west must for the present remain a matter of speculation; but that the Pandroseum formed a temple literally hypæthral, or open to the air of heaven, is certain, and though irregular in form, probably of nearly the same dimensions, north and south, as in the other direction.

Whatever may be the result of any further investigations respecting the Pandroseum, they cannot affect the arrangement of the Erechtheum containing the temples of Erechtheus and of Minerva Polias, which are the two that really interest us most, at least from an architectural point of view, and which may now be considered as determined with certainty to within the narrowest possible limits of deviation. All that now consequently remains to be done is to draw out its various architectural features, on a sufficient scale and with the amount of detail requisite to render them intelligible, and to reproduce the effect as far as is possible with drawings of that class. For obvious reasons I cannot attempt to do this myself, but I do hope it will be undertaken by some younger man and more accomplished draughtsman than I can pretend to be, for, except its great neighbour the Parthenon, there is probably no Greek temple so worthy of a monograph as this. The larger Temple unites all that is refined in form with all that is exquisite in proportion, welded together with almost too rigid a symmetry into the most perfect whole which the human intellect has yet produced within the range of architectural art. The smaller one, throwing symmetry on one side, and neglecting even beauty of proportion as a means of effect, excites admiration by the marvellous beauty of its details, and the perfect manner in which every feature of the exterior expresses the purposes and relative importance of every part of the interior. What was aimed at in the Parthenon, was to express the aspiration after beauty of the human mind, in its highest, purest and most intellectual form. The Erechtheum, on the contrary, undertakes the humbler task of copying and emulating the principles of nature, in so far as it is competent to man to do so, and its charm lies in the near approach it makes to elegance and truthfulness, combined with that motived irregularity which characterises all nature's works. The great merit of these two buildings, as objects of study, is that they contain within their walls every principle, from the most realistic to the most intellectual, adopted by the Greeks in elaborating the most perfect system of architectural art which the world has yet seen. But to appreciate their value they must be studied together. Those who confine their attention to the Parthenon alone may come to the conclusion that the style is too rigid and severe for human sympathy. The Erechtheum, on the contrary, teaches us how much of the higher principles of art, architecture can afford to throw away, and still not lose its hold on our affections for the beautiful; provided it is elegant in all its details, and truthful in the expression of every part. Without attempting to rival some other buildings in the somewhat vulgar element of size, the Parthenon is the most perfect example we possess of the true sublime in architectural art; while the Erechtheum, with its comparatively diminutive dimensions, aims at expressing all that is beautiful and elegant in design, without aspiring to rank in the same high class of artistic conceptions.

JAS. FERGUSSON.

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* Tetaz's drawing makes this angle only 10 degrees.

† Untersuchungen, p. 213 et seq. fig. 39.

THE LATE ENRICO ALVINO OF NAPLES,*

Honorary and Corresponding Member.

Italy has lost one of her most illustrious architects by the unexpected death of the lamented Commendatore, Enrico Alvino. He was born in Milan, on the 29th March, 1809; his parents were Vincenzo Alvino of Naples and Caterina Vallette of Nevere. Although born in Milan, he, nevertheless, considered Naples as his native country—Naples, the city of his ancestors, where he lived since childhood, and where he finished both his studies and his principal works. In 1829 he received his diploma as an architect, at the Royal University of Naples; after having obtained, at the Institute of Fine Arts of that city, the pension for Rome, he went, with a view of continuing his studies, to that city, which thus, by a strange coincidence, became at once the starting point and the final theatre of his artistic career. On his return, in 1835, to his beloved Naples, he was made an Honorary Professor at the Institute of Fine Arts; in 1838 he was appointed Professor of Civil Architecture and Drawing at the Military College at the Nunziatella (Naples); in 1850 Superintendent of Buildings in that city; in 1852 Architect to the Municipality; and in 1859, Ordinary Professor at the above-mentioned Institute, which nomination was confirmed after the annexation of the Neapolitan Provinces, by Royal decree, bearing date 20th October, 1861. During the last year Signor Bonghi, then Minister of Public Instruction, invited him to become a member of the Superior Council of Fine Arts.

He carried out numerous works, although the onerous duties of instruction, to which he dedicated his powers, and the many commissions he received filled up the greater portion of his time. Among these works I would mention the Monument of "The Martyrs" at Naples—a monument in which he revealed that ardent patriotism with which his soul was filled; the Palace "Nunziante" in Naples, and the magnificent alterations made in the Institute of Fine Arts, in the same place, in order to fit up a portion of that building as a museum for public exhibitions; at Castellamare, the palace which forms the most beautiful monument of that delightful place; in Amalfi, the restorations in the cathedral, which death has prevented him from accomplishing; and lastly, at Florence, the exquisite design for the façade of the Church of St^{a}. Maria del Fiore on the Basilica system.† But his greatest glory consisted in teaching architecture, which he imparted with rare erudition, giving it a new signification and discharging his duties with the greatest self-denial and with the most excessive love. Alvino may truly be said to be the founder of the modern artistic school of architecture, having been the teacher, leader and adviser of all the most renowned architects in Italy. In fact, he had succeeded at Naples the aged Saponieri in teaching architecture—that same Saponieri who, for the first time, sought to supplant cold, architectonical conception, based on misunderstanding and a servile imitation of classical forms, by another, which, while still attaching great importance to the experience and the beauties of the old masters, should not only be in keeping with the usages, requirements and the

* Extract translated from the Roman Journal *L'Opinione*.

† Besides the above-mentioned works, the following have to be enumerated:—The beautiful chapel in the Palace Nunziante, and the project for the façades of the Duomo at Naples; the Cathedral of Cerignola; the pretty Chapel of Prince Satriano, in the Church of Piedigrotta; and of the family d'Afflitto, in the Cemetery of Poggio Reale, where also many other monuments in marble, by Alvino, may be seen. He also erected the Cavalry Barracks at Chiatamone and executed many works of road engineering, &c.

tastes of modern life, but also exhibit the imprint of originality and harmony with the character of our era. What Saponieri did in Naples for art others repeated in literature and the speculative sciences, and thus was created that beautiful and vigorous era, in which so many chosen minds, who have since become splendid ornaments in Parliament, at the bar, the universities, in arts, critical science and philosophy entered upon their respective carcers. Alvino having, as before stated, succeeded Saponieri, extended more widely his predecessor's ideas, and by his talent, imagination and knowledge, gave a greater impulse to his teachings and opened out for them a new horizon. Being intent upon the regeneration of our architecture—that truly artistic architecture which once formed one of the great glories of Italy—he set to work through his writings, speeches and example, to attain the end he had proposed to himself. And although the times are not over favourable to architecture in general, and to artistic architecture in particular, he had yet the satisfaction of seeing his ideas triumph, both in Italy and abroad. It suffices to say in his praise that his school produced a Fiocca and a Cipolla—that Cipolla who felt for him the affection and reverence of a son, and who invariably ascribed to him all his own merit.

He was also cognisant of the art of painting and the plastic art, in which he emulated the architects of the fifth century. As an elegant writer and profound critic he published several treatises, among which the apologetic treatise written for the competition for the façade of St^a. Maria del Fiore, in Florence, deserves especial mention. He also wrote poetry, though he never published any. I hope I do not err in asserting that, among his papers, a perhaps unfinished poem will be found, of the existence of which some intimate friend of his only may have had any knowledge. Dal' Ongaro, on perusing one of his treatises, said of him: "If he is as distinguished an architect as he is a writer, he must assuredly be counted among the first."

His industrious life, consecrated since childhood to art and everything that is beautiful, came to a close in a locality dedicated to the culture of art; in the arms of his friends, themselves celebrated artists, surrounded by renowned works of art—ancient and modern. The touching words he, almost moved to tears, pronounced in the Cemetery of Naples, about a year ago, over the bier of his beloved Cipolla, may be repeated over his own:—"Noble and ingenuous soul," said Alvino, "his name alone suffices to express praise; he died, not in Naples, his native soil, but in Rome; he left behind him, great, unspotted renown, worthy to stand by the side of the masters whom we are accustomed from our very infancy to venerate."

E. D.

COMMUNICATIONS FROM E. C. ROBINS, F.S.A., *Fellow.*

THE HIGH SANCTUARY AT JERUSALEM.*

Rome, January 3rd, 1878.

My dear Mr. Barry—

With reference to the Discussion on the Haram Area at Jerusalem, I am constrained to say a few words in confirmation of Mr. Fergusson's theory respecting the Dome of the Rock, which, as you know, he believed to be the Anastasis built over the Holy Sepulchre, and erected by Constantine, at the suggestion of his mother; and that the present building, so called, does not cover the true site of the Holy Sepulchre, in which latter belief Dr. Robinson agrees with him. Rambling among the older monuments of this wonderful City of the Cæsars and the Popes, I came upon two buildings imputed to Constantine, which greatly reminded me of the so-called Mosque of Omar, which Lieut. Conder and others attribute to Abd-el-Melek. Mr. Lewin has shown the likeness of the said building to Diocletian's Temple at Spalatro, and claims to have traced its foundation to Hadrian and its reconstruction to Maximinus Daza, in the first decade of the fourth century. But the two buildings to which I now refer, together with that of the Anastasis, form a triad of contemporary buildings, presumably by the same hand, and singularly characteristic of each other. 1st, the Anastasis; 2nd, the Mausoleum of Constantine and Helena; 3rd, the Baptistery at the Lateran.

In the rear of the Basilica of St^{a}. Agnese fuori le Mura, founded by Constantine at the request of his daughter Constantia, but rebuilt by Honorius 300 years after, is the round church of Sta. Constanza, concerning which Hare says, it was erected by Constantine as a Mausoleum for his daughters Constantia and Helena, and turned into a church in the thirteenth century. The rotunda is 73 feet diameter, and is surrounded by a barrel-vaulted aisle. The drum of the cupola in the centre rests on an arcade of semicircular arches carried on 24 coupled granite columns of the Corinthian order evidently adapted from more ancient edifices. The aisle vaulting is adorned with mosaic arabesques of the fourth century—of flowers and birds with scenes referring to a vintage—which subjects are similarly repeated on the splendid sarcophagus removed to the Museum of the Vatican.

The Baptistery or Church of St. Giovanni in Fonte, which Murray says, in his latest edition, was erected by Constantine, who again employed the remains of more ancient structures in an octagonal building. The drum of the central cupola is supported on light marble columns which stand on the horizontal cornice of the entablature of eight larger columns of porphyry with Ionic and Composite capitals; the aisle surrounding the columns is of the height of the upper colonnade, the entablature of the lower order standing free of the side walls and suggesting the arrangement adopted at the Mosque. It is true that Hare says this Baptistery was built by Sixtus the Third, in 430, but he does not give his authority. The walls are surrounded by frescoes, depicting scenes in the life of Constantine and of later date.

* See page 25, *ante*; Paper by Claude R. Conder, Lieut., R.E.

The arguments adduced by Mr. Fergusson are, to my mind, so very conclusively in favour of his theory, that he needs but little help from outsiders to establish his views; and with regard to the suggestion that the columns of the Mosque seem to have been taken from older edifices, that is but an evidence in favour of its being erected by Constantine, who seems to have been in the habit of doing the same thing in Rome.

EDWD. C. ROBINS.

MUNIMENT CHEST BELONGING TO THE WORSHIPFUL COMPANY OF DYERS.*

Prior to the rebuilding of the Hall of the Dyers Company after the Great Fire, this chest was deposited at Salters Hall, and contained such of their treasures as escaped destruction. It is formed of sheet iron, cross-banded with iron plates, with heavy iron ring handles, and an ornamental escutcheon in the usual place of a lock in front, giving the impression that the lock is behind; but such is not the case. The real lock is an elaborately ornamented and ingeniously contrived apparatus covering the whole surface of the interior of the lid, which measures 3 ft. 9 in. long by 2 ft. wide. In the centre of this lid is the key-hole, covered by a small rose, similar to others fixed at the intersection of the cross-bands or braces strengthening the sheet iron of which the chest is formed. This central rose is made moveable, and when turned round reveals the key-hole, otherwise unobservable. The heavy and elaborately warded key is turned by an iron rod, and at once no less than sixteen bolts are shot in every direction beneath a rebate formed around the upper edge of the chest itself and which securely fastens it, much in the same way as an ordinary modern safe. The works set in motion by the key are connected with the spring bolts by metal rods with ornamentally engraved and outlined terminations disposed with great ingenuity; and the whole is encased like a watch in thin perforated steel plates beautifully engraved in a firm, bold style of ornamentation—the interlacing and foliated pierced scroll-work terminates or starts from helmeted figure heads of men in armour, or masks of animals. There are upwards of twenty-four men's faces, and ten animals, including the fishes and two admirably designed and vigorously executed unicorns. When these casing plates were passed round for inspection at the Institute, I hoped that gentlemen present would carefully note the peculiarities of the chest and assist me to determine its precise date and style of ornament, since there is no date upon it, and a considerable difference of opinion has been expressed as to the probable country of its manufacture. By some the work is considered to be Italian or French, by others German or Flemish; but all agree that it belongs to the 16th century. I also exhibited a drawing of a similar and larger chest in the possession of the Clothworkers' Company, and a photograph of that in the Bodleian Library, besides rubbings of two French locks in the Bethnal Green Museum—one of which, in my opinion, is precisely similar in design, with pierced scroll ornament, beautifully engraved and terminating in figure heads with helmets of the same pattern. Consequently, if the Museum specimen be a genuine French lock of the year 1600, the presumption is, that the date and parentage of the chest belonging to the Dyer's Company is the same; but Mr. Stannus has lent me lithographed illustrations of German work, also nearly identical in design and workmanship. In conclusion, it may be useful to add that the Bethnal Green Museum of metal work is very rich in chests of this description—two large ones and four small—all of them singularly beautiful, remarkably interesting, and considered to be of German origin.

EDWD. C. ROBINS.

* Mr. Robins, as Prime Warden of the Dyers' Company, has recently caused this chest to be opened and repaired.

THE LATE GOTTFRIED SEMPER OF VIENNA,

Honorary and Corresponding Member.

Our Honorary Secretary has called my attention to the sad loss we have just suffered in the death of our distinguished Honorary and Corresponding Member, Professor Gottfried Semper, at Rome. As he was an intimate friend of mine I venture to offer this brief notice of him; it is an early tribute to one for whom I had a sincere personal regard, and whose talents I greatly admired. The first reference that we have of him in the records of this Institute appears in the Essay on the Polychromy of Greek Architecture, published in the first volume of our Transactions 1836, and which was a summary of Dr. Kugler's elaborate work on that subject. In the introduction to that Paper the following words occur: "Herr Semper has very recently expressed himself in terms still more decisive (than those of M. Hittorff) in his preliminary observations on the painted Architecture and Sculpture of the Ancients,* and on the strength of his own researches in Greece; he assures us that he has discovered a complete coating of colour upon all—even the most remarkable monuments of Pericles—and he has announced shortly the publication of those monuments, restored according to one uniform system with their proper colours. He has also, since his return from Greece, exhibited at Berlin, in different societies, a considerable portion of his restorations, which are certainly very ingenious, and which are said to have excited among the younger portion of his countrymen, a degree of enthusiasm—the forms of Greek architecture now appearing for the first time to become intelligible, and to present, as a whole, a lively perception of the motive, which gave birth to them." Such was the notice of his researches by Kugler in 1835.

Gottfried Semper was born on the 29th November, 1803, at Altona on the Elbe—at that time the second city of Denmark. In accordance with the wishes of his father he first studied law at the University of Göttingen from 1822 to 1825, himself wishing to become an artilleryman. But from 1826 he devoted himself to art, and pursued his studies at Munich under Gartner, and stayed three years at Paris with Gau, for whom he ever entertained the highest respect. He then visited Italy and Greece and returned with his portfolios rich with the studies of ancient monuments. In 1834, he published his short but suggestive essay on the "Painted Architecture and Sculpture of the Ancients" in 8vo.,† at his native town, and alluded to by Kugler. His talents then seem to have been appreciated in Dresden, where he was invited to go as Professor of Architecture in 1834, on the recommendation of Schinkel, and there he erected his beautiful theatre, completed in 1841 and burned down in 1869. It was published in a folio work at Brunswick in 1849. An inspection of this exquisite volume‡ in our library will show the refined and pure taste with which he carried out the cinque-cento style of Italy, and combined in his plan with considerable intelligence all the requisite technical adaptations of that important class of buildings; and this became justly the foundation of his European reputation. He was the architect of the splendid Synagogue in that city, and designed all the fittings and even the sacred vessels. He built the Female Hospital and the Oppenheim Palace, and other buildings, as the Gothic Fountain in the Post-Platz and the Villa Rosa; and in 1847 he began the New Museum. In all these he yielded to the passion for coloured decoration, which he introduced profusely, thus realising the dreams of his early years. He

* Semper's work, "Ueber Polychromie und ihren Ursprung," 8vo., Braunschweig, 1851, is in the Institute Library.

† "Vorläufige bemerkungen über bemalte architektur und plastik bei den Alten," 8vo., Altona, 1834.

‡ "Königliche hoftheater zu Dresden," folio, Braunschweig, 1849.

was the architect of the King of Saxony, who bestowed upon him many personal favours. However, in the unfortunate political disturbances, which took place in Dresden in 1849, he allowed an irrepressible political and democratic feeling against kingly rule to overpower his better judgment. He forgot the grateful allegiance he owed to the Sovereign, and he took part with the insurgents, whom he assisted with his professional talents, having prepared (as it was said at the time) a plan of Dresden, with the indications of the spots where barricades should be put up to oppose the Royal troops.

This unfortunate burst of personal feelings was the commencement of a sad violent struggle for years with misfortune. He was obliged to fly, leaving his family in Germany, going for a short period to Paris, the scene of his early studies, and coming over to England as a place of refuge and possible employment and precarious means of subsistence. In 1852 he joined the Department of Practical Art at the South Kensington Museum to teach the principles of decoration as applied to metals of all kinds, and began a treatise on the subject, which it is to be feared he never finished. He designed the certificate for the Art Department. He also designed the Wellington Car, which bore the remains of the illustrious Duke to their resting place in St. Paul's Cathedral; it was conceived in the spirit of the Imperial Carpentum on the Roman coins, and was covered with bronze work. In 1853 he made a rough sketch for erecting buildings on the present site of the South Kensington Museum, for which he was paid by the Prince Consort, and it is still to be found in the Museum; for this subject the Prince invited and received designs from other architects.

After passing a few dreary years with his family in England, there was offered for his acceptance at Zurich the Professorship of Architecture in the University; and he erected there in the upper town a large building for the Polytechnic Schools, as well as the Town Hospital, and likewise the Town Hall at Winterhalter. I know not whether it was his teaching, which influenced the taste of the subsequent architecture of the town, but I cannot forbear seizing this opportunity to notice the Railway Station built since his time, and well worthy the attention of the traveller. The interior halls especially are conceived upon the style of the Thermæ of the Romans, and similar to them in largeness of conception as to plan, and admirable for the decorative features. Some of the buildings in the streets and squares by recent architects are equal to the finest commercial erections in Paris or London, and superior in taste.

Semper represented Switzerland, as its Commissioner, at the Paris International Exhibition in 1867; and he designed and constructed the Swiss building containing the pictures and other art productions of that country. He took the opportunity of carrying out his theory of ancient polychromy by painting the exterior a bright red colour. By a strange combination of circumstances he, who, in 1849, fled as an exile from Dresden, was, in 1870, employed as architect to rebuild there the theatre he had erected in 1841, and which had been burned down in 1869. He, however, only occasionally inspected the progress of its erection, which was carried out by his son. How striking to see the power of genius, which could outlive the passions and prejudices of the past, and replace the fugitive in the distinguished and honourable position he had held twenty years before!

In 1869 he made a design for the Exchange at Vienna, and in 1870 was called thither to make a selection from sets of drawings sent in competition for a new museum in that city. He chose one by the architect Hasenaur, and having suggested important improvements, he was associated with the author to carry out the revised project. He also designed and erected the new theatre in conjunction with his colleague Hasenaur, and made material additions to the Hof Burg, the imperial residence.

His latter years were not happy at Vienna, and, as he was much afflicted by asthma, he went to Italy,

living alternately at Venice and Rome. After the struggles and successes of half a century of active artistic life, there is something very touching to contemplate a veteran architect seeking the softening influences of the Italian atmosphere to alleviate the sufferings of disease. We may imagine him at Venice, reclining on one of the benches under the columned arcades of the Ducal Palace, contemplating the works of those great masters with whom he is worthy to be associated in our memory; or we may figure him to ourselves seated on a marble fragment in the Forum of Rome's palmy days, ruminating on its past Imperial greatness. Thus he might well fill up moments and hours, not occupied by more serious thoughts of his approaching end. Among these might doubtless be revived delightful memories of youthful studies, and he might contemplate the rich intellectual results and inferences, which his large experience had stored up. And let us hope that, in this harvest of thought and reflection, he may have left us some precious results to delight and instruct us, and make us better appreciate what has been effected by those great men of old; by what inspirations they were guided, and how we might be (as he was) possessed of noble ideas, and be able to produce (as they were) works that may be the admiration of future ages. Surrounded by such associations, Semper breathed his last at Rome, in the 77th year of his age, on the 15th of May last. We must sympathise then with the great artist, who returned to pass the last days of his existence among the monuments and scenes of his early emotions; leaving his ashes in the soil of a country, that nourished the art, to which he had devoted the thoughts, intents and labours of his eventful and lengthened existence.

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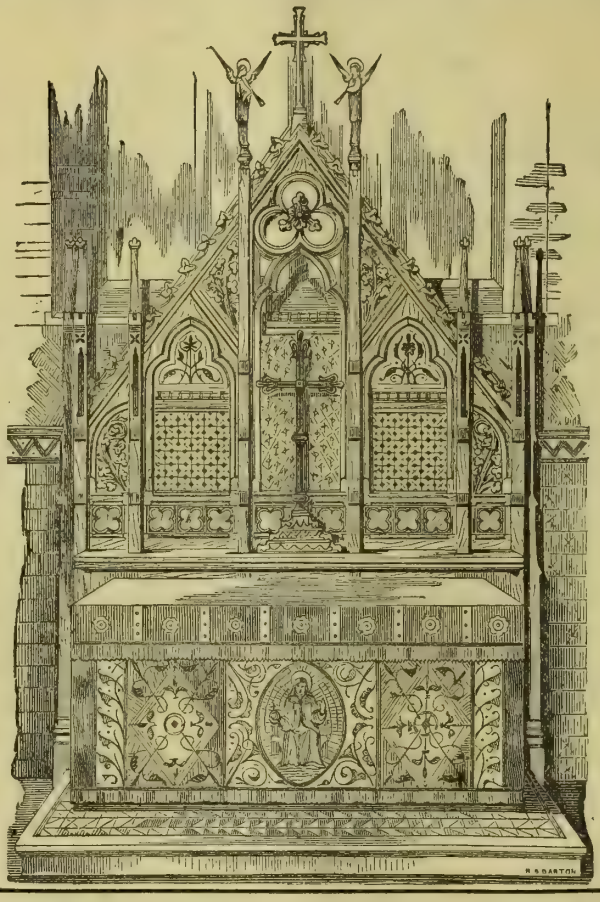

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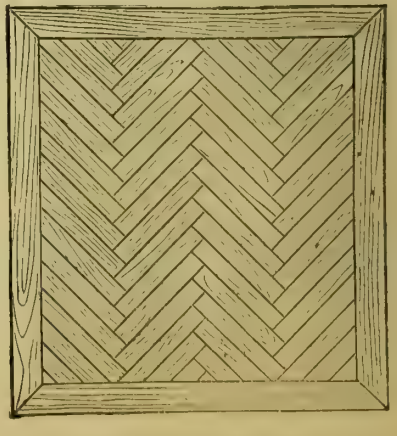

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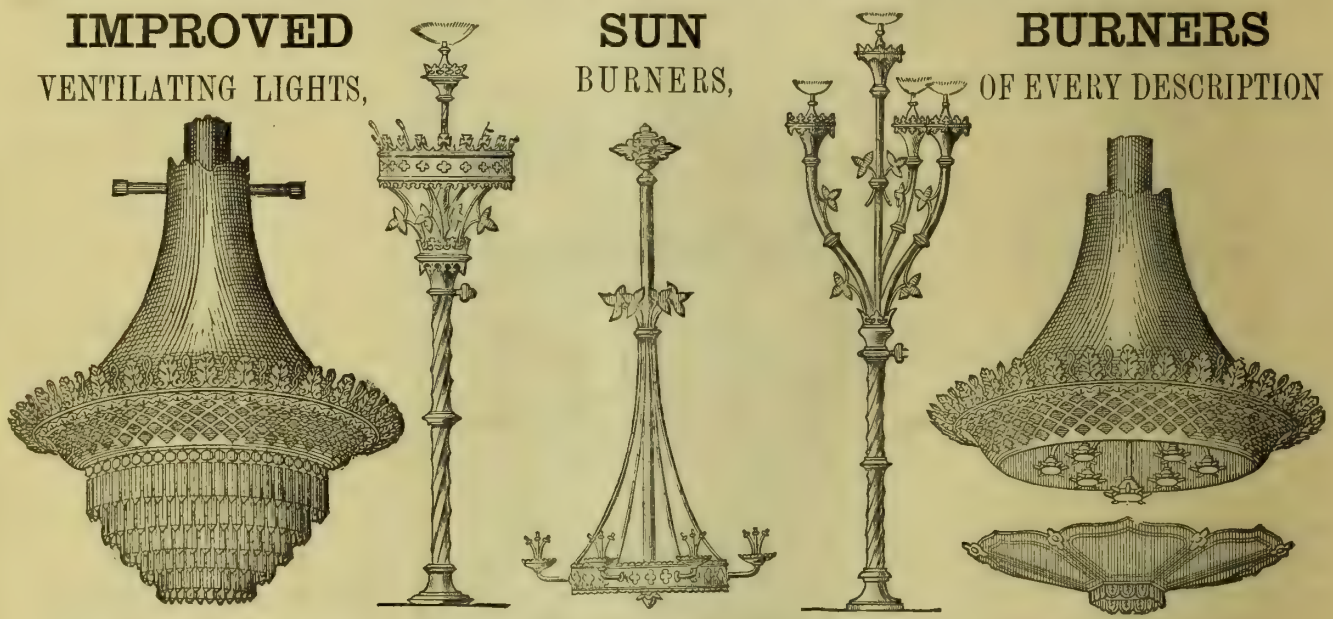

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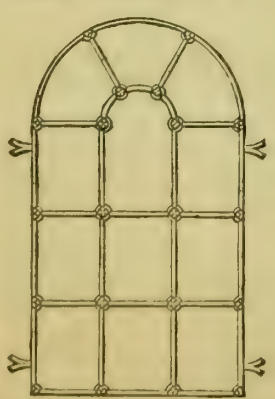

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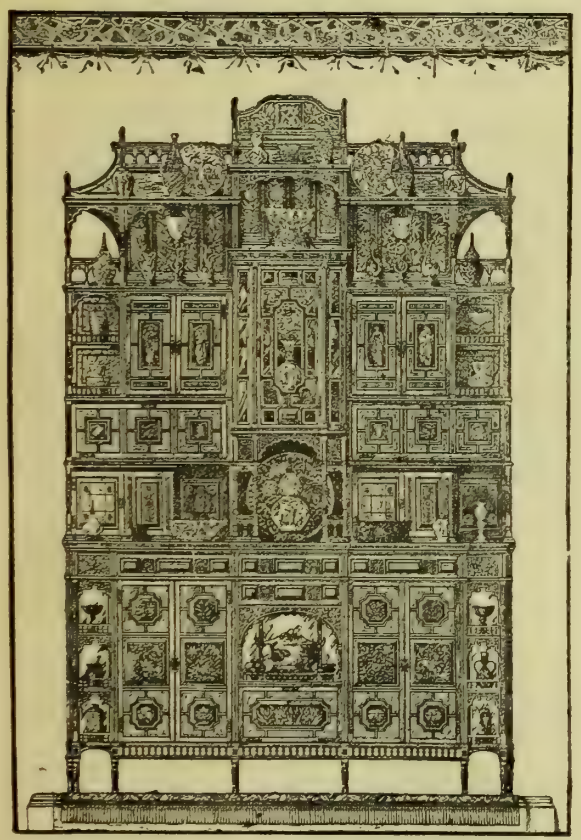

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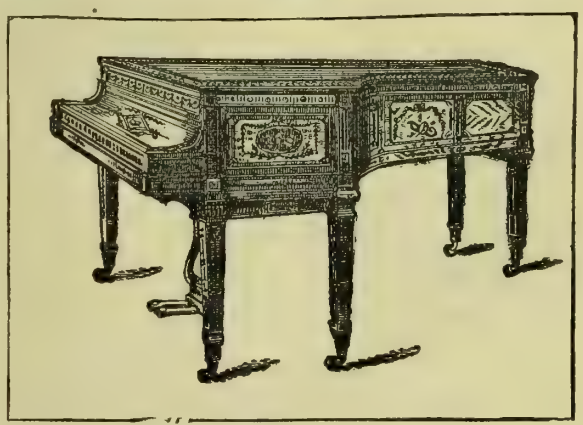

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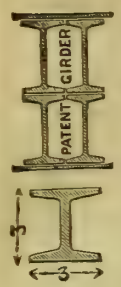

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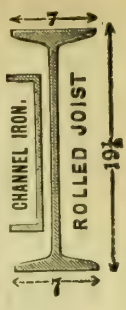

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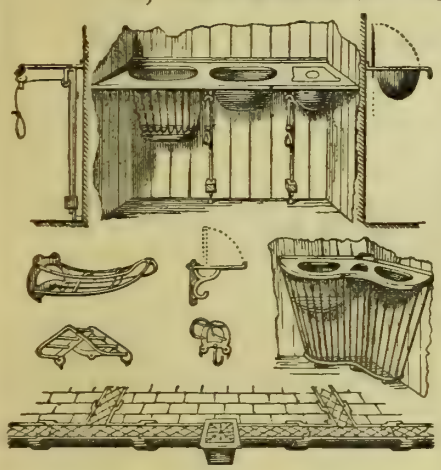

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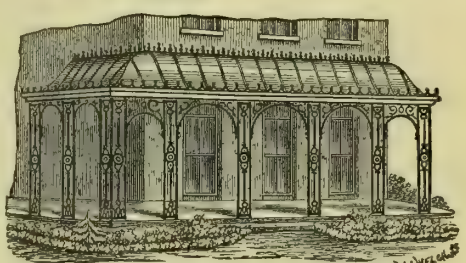

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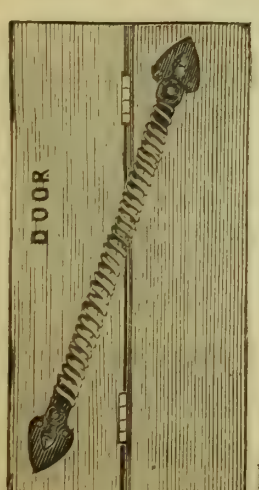

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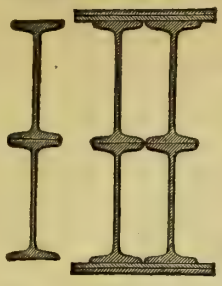

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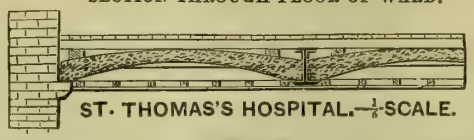

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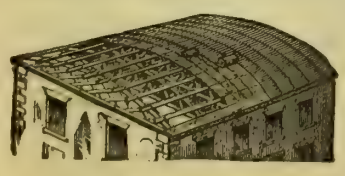

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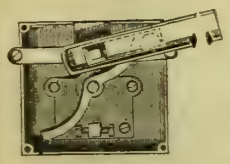

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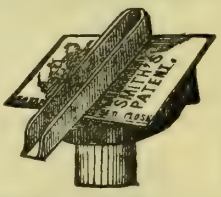

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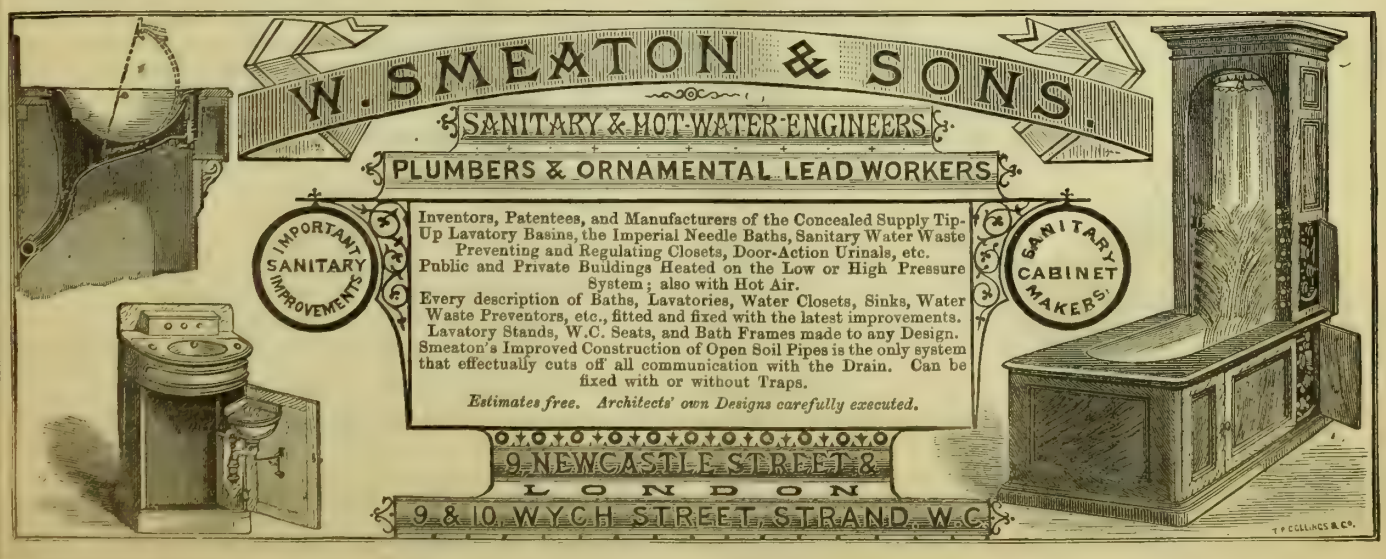
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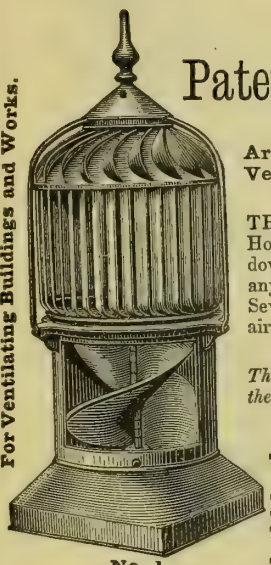

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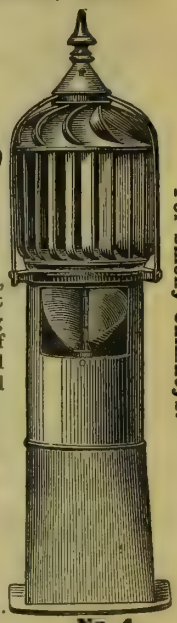

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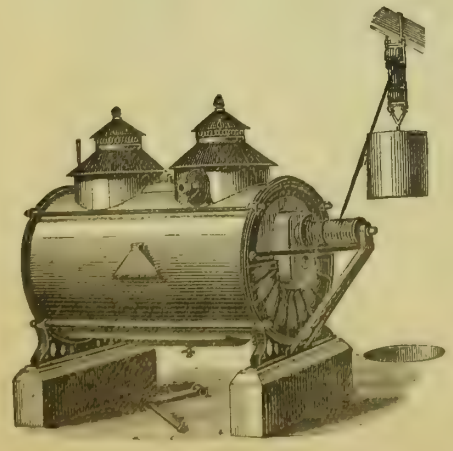

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